FLIGHT

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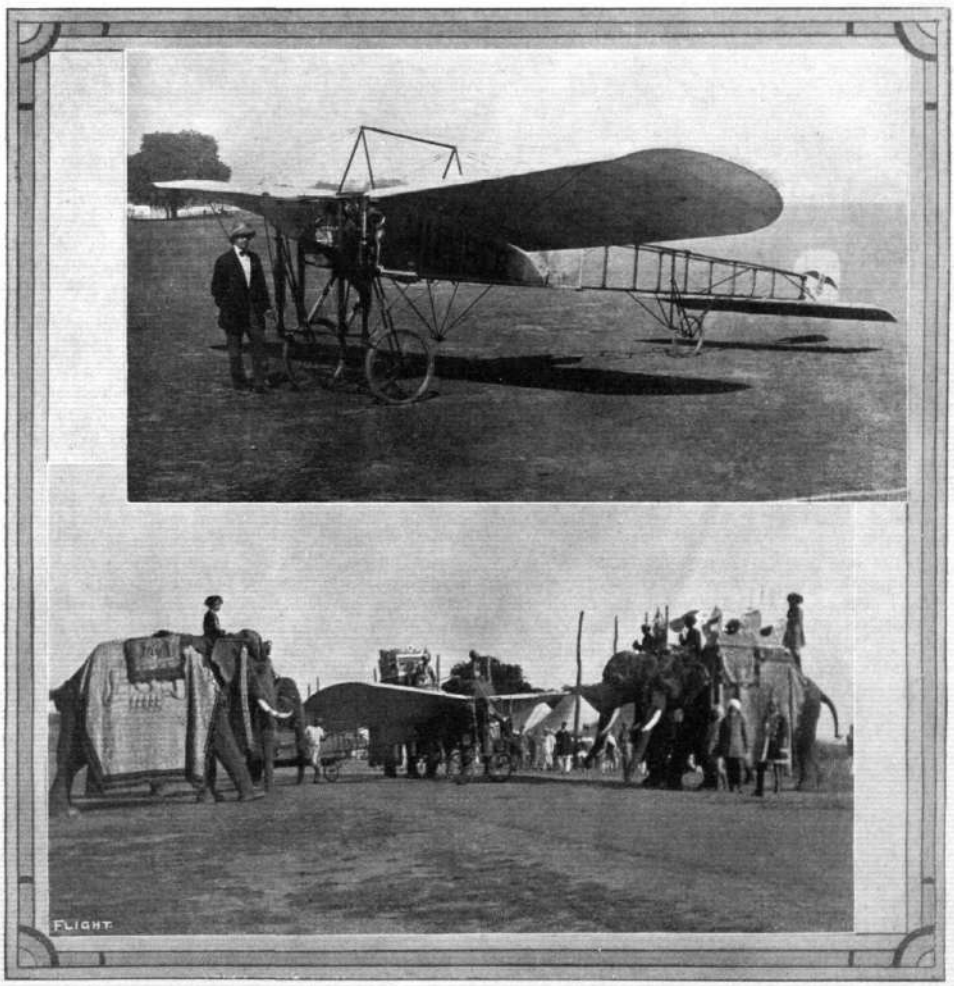


AVIATION IN INDIA.—Mr. Keith Davies with his Humber monoplane under "inspection" by the elephants. Above, Mr. Davies is standing in front of his 3-cyl. Humber-engined monoplane.

WAR OFFICE POLICY FOR 1911.

By HARRY HARPER.*

SURMISES, hints, and indifferently true reports have so far been all that have indicated what the War Office policy towards the aeroplane during 1911 really is. Its critics, on the contrary, have had full scope for explaining their views. Therefore it is only fair that the War Office view should be given. This I am able to do, not from straws picked up here and there, but upon firm and definite authority. Even so great an organisation as the War Office likes upon occasion to be accurately represented. To make the official policy during 1911 quite clear, it is as well to set forth briefly, under six headings, what the chief criticisms of the War Office in its handling of aviation really are :—

1. We are developing airships almost to the exclusion of aeroplanes.

2. The large expenditure upon airships and airship sheds will not permit sufficient money being spent upon aeroplanes.

3. The War Office does not realise that aeroplanes have, by their recent development, become superior to airships.

4. The ten aeroplanes at present in hand and ordered are altogether insufficient.

5. The War Office does not realise adequately the wonderful progress made by the aeroplane for war purposes.

6. It is dangerous to assume that we can make up leeway by purchasing a large number of machines, because money will not buy experience or trained men.

Having thus cleared the ground, it is possible to embark upon a series of authoritative replies. In the first place, the point is contested that the policy of developing the dirigible balloon is a wrong one. Critics of this policy declare that France and Germany, both staunch advocates of the airship in the first place, are now neglecting this form of aircraft in favour of the aeroplane. Officially, this statement is not regarded as accurate. The War Office information is that, although both France and Germany have at the moment begun to direct a great deal of attention to war aeroplanes, neither country is neglecting the airship. On the contrary, it is held that both France and Germany still attach very considerable importance to the airship.

Although the aeroplane possesses many advantages over the airship, the official view in England is that there would be several tasks in actual time of war which the dirigible balloon could carry out more effectually than the aeroplane. Principally, in this connection may be mentioned the work of very detailed reconnaissance. Parliamentary critics who have waded laboriously all through the Estimates declare that so much of the £113,000 available is to be expended upon airships, sheds, and incidentals of the lighter-than-air service that, should it become necessary to augment the scanty aeroplane fleet to any appreciable extent, there would be no money forthcoming for such a purpose. Here again, however, the War Office joins issue with its critics. I am enabled to point out that although, as is usually the case, money has been laid aside for a variety of purposes, as seems most expedient, there is nothing at all to prevent the War Office, should the urgency of the situation demand such a course, obtaining any further sum of money required, after having the additional expenditure sanctioned by proper authority. What it is meant to convey by this is that there is elasticity if necessary in expenditure, and that the War Office is not helpless as regards future developments during any given year, should it have allocated its money-spending at the beginning of the year under certain heads.

To the criticism that our ten aeroplanes are utterly insufficient, the official reply is that they are quite adequate for the present purposes to which they are to be put. They are to be regarded and used merely as instructional machines. Between now and the manœuvres the officers who are to take part as airmen and observers in the operations at the manœuvres will receive their training upon these machines. Should any of the machines be damaged they will be replaced, and should it be found that more extensive plans are necessary for purposes of tuition they will be made. This leads to a very important explanation of War Office policy. At the manœuvres this year it is the intention to make a most complete and exhaustive test of the aeroplane for all war purposes. This test will be carried out carefully and practically ; and upon the result of it the future undertakings of the authorities, in regard to their aerial policy, will very largely depend. In this practical testing of the aeroplane under war conditions it is probable, of course, that civilian airmen, in the form of a special reserve—such as Mr. Grahame-White is now negotiating with the War Office—will co-operate with the military pilots. In this regard there is every reason to state that if the aeroplane emerges with definite success from these tests in the manœuvres, the air-service will be placed without delay upon a more ambitious footing.

Officially, the purchasing in a general batch of any large number of aeroplanes at the present moment is regarded as being a piece of very bad policy. Types are changing so quickly that a fleet, say, of 50 machines would, it is held, probably become obsolete in a month or so. The sensible policy is rather considered to lie in acquiring no more machines at the moment than are needed for instructional purposes.

Supporting this policy, it is urged that machines are extremely cheap in comparison with the cost of any other form of armament, and that they can also be very speedily built. Therefore there is not considered to be any vital need to buy extensively of present types of machine. Of course, it is here that the critics and the War Office come to an important divergence of opinion. The critics affirm that the War Office has not got enough machines to carry out instructional work on an adequate scale. The War Office, on the contrary, declares that it has. The critics affirm that the War Office will not at its present rate of progress be able to test the aeroplane adequately in the manœuvres. The War Office, on the other hand, does not hesitate to say that it will. Expert critics have told the War Office very definitely that it will take a year, if not more, to train an officer to be a thoroughly expert pilot and observer ; but with this contention, although it will not specify any definite period, considering there to be so many degrees of efficiency, the War Office does not agree.

This question of training men is, however, officially regarded as being the most important that exists at the moment in regard to military flying ; and I am able to say that it is the point which is now receiving the most careful possible attention.

* Joint author, with Claude Grahame-White, of "The Aeroplane ; Past, Present, and Future."

FLIGHT

MODELS AT OLYMPIA AND A PRIZE SCHEME.

THIS year, as on former occasions, a display of models at Olympia was organised by the Royal Aero Club assisted by the Automobile Association and Motor Union, which bodies voted a sum of money to constitute a prize fund that was distributed by the judges as follows :—

For flight capacity, as demonstrated by actual trial :—

1st Prize, £4 4s., to W. H. Sayers for the Ding-Sayers model biplane No. 49.

2nd Prize, £3 3s., to M. Gordon Jones for the model biplane No. 35.

For good workmanship :—

1st Prize, £4 4s., to G. P. Bragg Smith for the model biplane No. 50.

2nd Prizes, of £2 2s., to each of the following competitors :—

W. Birkinger, for the scale model Blériot No. 6.

G. T. R. Hill, for the model biplane No. 31.

W. J. and H. E. Startin, for the model Antoinette type monoplane No. 52.

Special Prize of £3 3s. to H. Burge Webb for the working model whirling table.

No awards were made for originality in design.

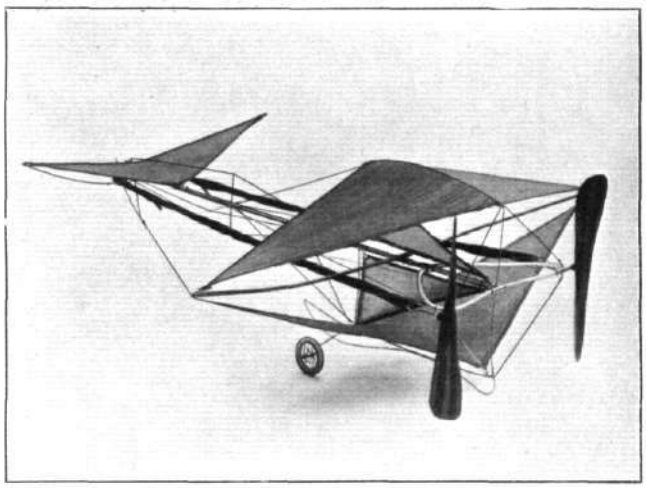
Of the above statements the last is the most significant and the least satisfactory, for it must be confessed that individually and collectively the models at Olympia were disappointing in this matter of originality in design. From some points of view we are inclined to think, however, that as much is not done as might be done to encourage this particular aspect of the Exhibition along lines that would be more readily appreciated by the competitors themselves. Since the very first Show at Olympia, we have most strongly advocated the classification of models on show into one or other of three definite categories, and our reason for doing so has been mainly because such an action on the part of the organising bodies would have, we imagine, a strong influence on the nature of the work submitted. The arbitrary classification that appears to us desirable, at any rate by way of a start, is to regard a model as being either :—

1. A toy built primarily for the purpose of amusement by its capacity for actual flight ;

2. A scale model built as a miniature replica of some well-known machine, and exhibited primarily for its high-class workmanship ;

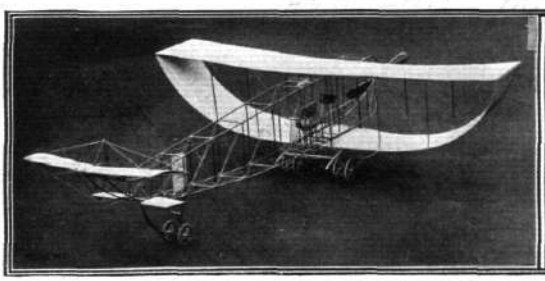
3. An original design, built on a small scale in order to afford a working model of some mechanism or other special feature that it is desired to illustrate in a more satisfactory manner than can be done by drawings.

It is always in respect to this last category that most confusion prevails, for nominally almost every exhibit at Olympia would appear to belong to it according to the generally vague descriptions of the exhibitors themselves. It is this absence of a definite and clear purpose in the nature of the models exhibited that is the most unfortunate feature of the latest and past model shows, and it is in the direction of encouraging definite purpose that we consider the organising bodies can do most useful work, primarily, as we have suggested, by announcing in advance that competitors must enter their exhibits under one or other of some definite series of categories. As a matter of fact, the judging of the exhibits for the award of prizes has proceeded more or less in accordance with the above suggested principles on these last two occasions ; but the fact that the model-makers themselves are not bound to enter in a definite category naturally introduces difficulties and tends to frustrate the best efforts of the organising bodies in their desire to give really useful encouragement to this important, if second, line in a great movement.



The Ding-Sayers small biplane, which took first prize for flying, and is capable of rising from the ground under its own power.

Next year we shall hope to see something of this sort put into definite practice. But that in order that we may do our part without delay in trying to prepare the ground, we have decided to institute a prize scheme of our own for ideas, full particulars of which will be given next week. Primarily, the model exhibits at Olympia, when judged under the



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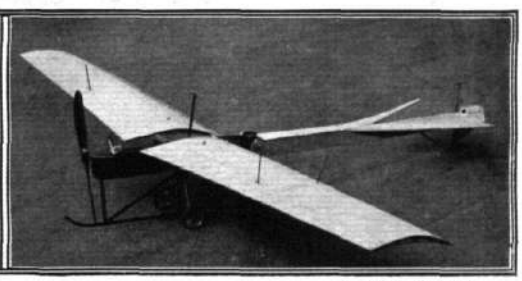
Scale model of the G. P. Bragg Smith automatic stability biplane. This model was awarded the first prize for workmanship.



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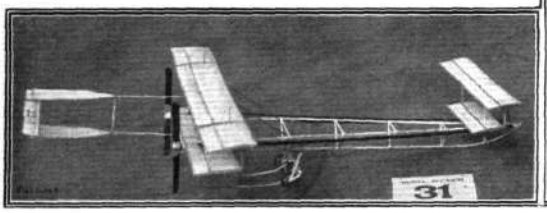
1½ in. scale model of an Antoinette monoplane, constructed by W. J. and H. E. Startin, which received second prize for workmanship.

classification of originality, display a marked absence of logical thought on the part of the designer, based, it would seem in most cases, on a lack of appreciation of what has already been done in the practical field. We feel convinced that there is nothing more conducive to the acquisition of this intelligent appreciation of the why and wherefore of things as they are, than the practice of writing short essays setting forth the claim of things as would-be designers think they ought to be; and fundamentally our own little prize scheme will be found to have the purpose of encouraging such thought and interest in the hope that it may help those who take part in it to materialise their mental labours in an actual model of set purpose at Olympia next year.

In some respects this particular section of model-making must always present special difficulties for those who have



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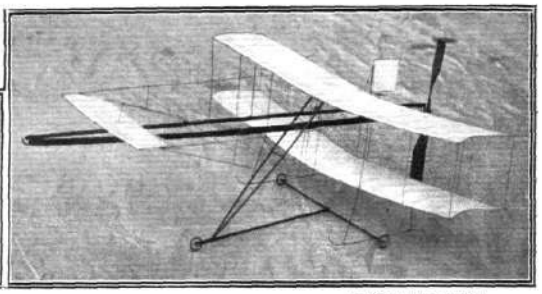
G. T. R. Hill's biplane, which also tied for second place for workmanship.



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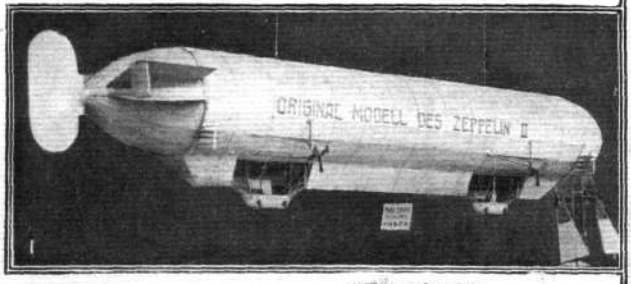
The Gordon Jones dihedral biplane, which gained the second prize for flying.

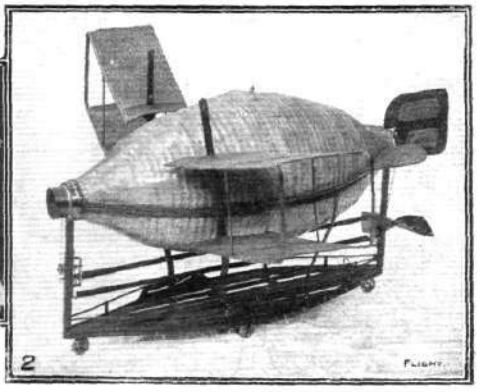
to award prizes in connection therewith. In the first place it is necessary always to bear in mind that flight is based on the great science of aerodynamics, which science plays a secondary part in most of the other fields of practical engineering. A close study and appreciation of the principles of aerodynamics and their application to flying machines should, therefore, be the first consideration of all model-makers. To those working purely along this line it will be evident that a model which is useful for the purpose of demonstrating some important principle in aerodynamics need not necessarily bear any resemblance to an actual machine. On the other hand, this same category broadly conceived also includes models that are built to demonstrate the working of some purely mechanical device in connection with the construction or control of the machine. In this case the aerodynamic considerations may conceivably play a less important part as compared with a knowledge of ordinary engineering, although we cannot imagine anyone succeeding in winning a prize who failed to appreciate the fundamental aerodynamic situation in the first instance.

Thus, for example, suppose we take the basic idea of varying the angle of incidence of the wings of a monoplane in flight without altering the attitude of the body. In the first instance this would have been an original idea, and then some quite simple and possibly unmechanical construction would have been sufficient in order to illustrate it as an idea, always assuming of course that the purpose of the arrangement, from the aerodynamic standpoint had been clearly and logically set forth by the competitor. As things are, this happens no longer to be a new idea; but it is not necessarily any the less a useful notion because it has not been generally adopted, and it would show an appreciation of things as they are, for the young model-maker to realise that one of the causes of this state of affairs is doubtless due to the mechanical difficulty of making the required adjustment. Here, therefore, is an opportunity for the inventor with an engineering turn of mind, who, having learned enough of aerodynamics to understand the purpose of the general manœuvre, sets himself definitely to work to evolve a mechanism suitable for the purpose of giving it effect. In this case it is obvious that the model must go into detail just as far as may be necessary to indicate clearly the essential points of the suggested method. If, for the sake of example, someone studying this subject saw that by an ingenious rearrangement of the guy-wires it would be possible to allow the movement of the wings to take place without altering their present strength, then a simple little model of the whole machine showing this new disposition of the wires is the kind of thing required. Another competitor might tackle the question of a suitable mounting for the wing-spars, or a special mechanism for rocking them, in which cases the exhibit would properly consist of a fairly large-scale working model of the devices in question, with a mere statement as to the types of actual machine to which they are applicable.

We emphasise these points at some length because it is precisely in respect to the appreciation of the true purpose of this side of model-making that the exhibit at Olympia fails this year as it has failed before. Exhibitors in many cases show models that are quite obviously too crude to illustrate anything but a basic idea, and either the idea in question is not original, or it clearly shows a lack of appreciation of fundamental aerodynamic principles. In most cases, too, where models have been exhibited to show mechanical details, the general principles of engineering have been ignored.

MODEL AIRSHIPS AT OLYMPIA.





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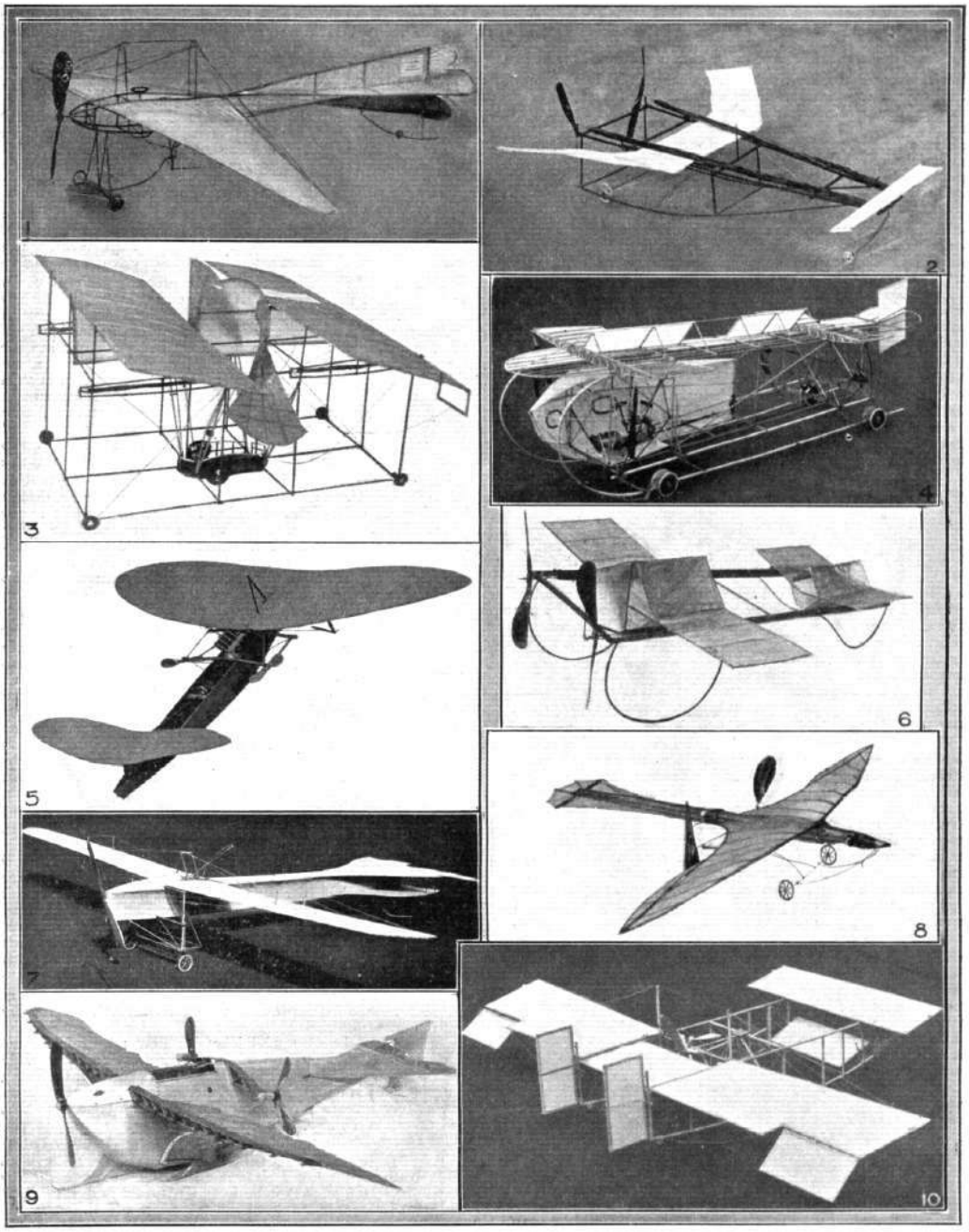
1. A. Isenthal, model Zeppelin. 2. J. Buzzard.



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MODEL MONOPLANES AT OLYMPIA.

1. J. J. Holt. 2. E. Hayman. 3. G. M. Ferrest, tandem monoplane. 4. W. Le Maitre, low "C.G." type. 5. T. W. K. Clarke "tail first" type. 6. W. H. Booth. 7. M. F. Cravo. 8. F. Canning, "bird" type. 9. C. Wynwood, "hydro-curve." 10. B. R. Lee, model Valkyrie.

There is yet another difficulty in connection with this section of model-making, a consideration of which shows all the more clearly why it is desirable that a definite scheme should be drawn up in advance. There is a very considerable difference between agreeing that some idea is sufficiently original to be eligible for a prize purely on the score of originality, and in agreeing that the idea itself has a reasonable claim to be considered meritorious in principle. At the moment it is impossible to feel otherwise than that the award of a prize in this section would in some manner be an expression of approval on the part of the judges in respect to the practical merits of the principle of the device for which the prize was awarded. Let us take, for the sake of example, such a model as that exhibited by A. H. Bailey, which consisted of a biplane fitted with obliquely arranged side-curtains mounted in frames, and so attached by cords to the main planes as to be capable of being warped for the purposes of stability and control. Although fundamentally introducing the principle of the dihedral angle, and other principles such as ordinary rudder action combined with the screening method utilised on the Neale biplane, there might well have been sufficient originality in the device to warrant the judges recognising it as an idea. On the other hand, it is quite a different matter if they are asked to sanction it in any way or to signify their approval of it as a workable invention. For our own part we foresee that there must always be this difficulty, and feel very strongly that the best objects of the prize-givers will be attained by having it clearly set forth in advance that the award of prizes in this section does not imply approval of principles that have not been tested in the presence of judges, unless the same is clearly stated in the notice of award.

When it comes to a consideration of the other categories there is less difficulty in selecting models that are worthy of comment, and as may be observed from the list of prizes the judges have not hesitated to dispense encouragement wherever the seed thereof shows likelihood of falling on good ground. In the case of models exhibited for workmanship, however, the prize distribution follows lines that are somewhat at variance with the general scheme recommended and advocated by us above. Good workmanship, *per se*, may be applied equally to any form of model-making, and where the model in question is a flying machine and is not intended to be useful either as a toy or as illustrative of an original idea, we consider that it ought to be a scale copy of some actual machine that has been selected. The reason for this attitude is quite definite. If the model is a toy or embodies an original idea, it should be entered in the corresponding class and not be judged for workmanship except as a secondary consideration. If it is incapable of demonstrating either actual flight, a new principle, or some mechanical movement, then the correctness of its general lines and detail must be taken for granted, which can only be done when the model represents something that elsewhere has been demonstrated successfully. Prizes for pure workmanship should therefore be given, we consider, for scale models only, although we must admit that under the present arrangement the judges could scarcely have done otherwise than make the awards they have. In connection with making scale models, it should be unnecessary again to remark that the idea of encouraging an intelligent interest in the work should be a basic principle underlying the distribution of the awards, for the organising bodies are concerned with aviation and not with wood-working, carving, or any of the other arts that are pressed into the service of the model-maker and that doubtless receive individual encouragement from their own societies in other quarters.

A scale model is distinctly useful as a record of actual achievements, and as such is worthy not only to receive a prize but to be kept in a prominent place. As we mentioned last year, we should like to see the Royal Aero Club acquire small scale models of successful machines with a view to building up gradually a museum history of flight. Very possibly if the models exhibited at Olympia were worthy of that distinction, some such scheme might be adopted, but most certainly they are not at the present time. From the standpoint of mere workmanship, some of them reach a high degree of excellence, but none are really faithful copies. There is, of course, a great deal in a full-sized machine that cannot be reproduced actually to scale, but this is only all the more opportunity for the model-maker to exercise his appreciative faculty in the elimination of such details as are unnecessary. Elimination is one thing; alteration another. When a model-maker copies a machine he should copy everything and not introduce variations of his own. If some detail is too small to be copied faithfully, some appropriate dummy should be set in its place as an indication of its presence. At the present time model-makers in this section chiefly fail because they copy the superficial appearance only, and alter many of quite the important features of the machine.

In the section of model-making that is devoted to the construction of what we have perhaps inadequately described as toys, there is now, as there has been from the first, the greatest evidence of all round ability and real progress, and we can only suppose that the fact that there is a commercial side to this undertaking has had much to do with the comparative superiority of this class of work. It is, as we have said, perhaps inadequate to describe these models merely as toys, but the term serves to differentiate our meaning better than any other that we can use at the moment. After all, there is nothing that is derogatory about a toy, and very possibly it serves a more important part in the matter of encouragement—by awakening an interest in flight outside the sphere of those at present associated with the movement—than is accomplished by either of the other sections. Moreover, the successful construction of a toy under the conditions of fairly energetic competition such as now prevail, is by no means the easy and simple accomplishment that it was when a toy was a model that would only fly by a pure stroke of luck or a trick of launching. Model-making for the toy category demands an appreciation of fundamental aerodynamics, of engineering principles and of what has actually been accomplished in the practical field. The latter is useful primarily as a guide in design, but also for commercial reasons because the public eye is more likely to be attracted by something that it easily recognises. A knowledge of fundamental aerodynamics is necessary in order to adapt quickly and effectively the general lines of an actual flying machine to the requirements of a practical flying model; and a knowledge of engineering principles is essential if the model is to be built so that it will withstand rough usage. Especially is this true of models that are rather elaborate, and it is most satisfactory to be able to record the progress that has been made year by year along these lines.

This year, for example, the progressive feature is most decidedly the capacity for rising from the ground demonstrated by the Ding-Sayers model, also by a rather larger model constructed by M. Gordon Jones, who obtained a prize in this section for the flight capacity of a smaller model not equipped with an under-carriage, suitable for starting on the ground. The little Ding-Sayers machine not only flew beautifully, but would rise from the ground every time, and even though the floor was rough concrete. Moreover, the place where the flights were made was full of obstructions, and sooner or later the models would be sure to dash full speed into something hard; but although every effort was made in this way to break up the Ding-Sayers flyer under conditions that might quite well be experienced in practice, only a single wire came adrift, and that was only unhooked, so that it could be replaced without necessitating any sort of structural repair. As an engineering construction on a small scale, therefore, the Ding-Sayers model was quite worthy of notice, and as a design of biplane it is distinctly interesting as an adaptation of modern methods to the requirements of models.

The Gordon Jones model likewise flew admirably, and withstood equal knocking about without damage, while as an engineering construction it was especially interesting on account of its simplicity and because, as a type, it was more closely similar in appearance to the popular conception of an actual aeroplane.

The Burge-Webb model flyer is another extremely satisfactory toy, but the particular model that made the best demonstration for the judges showed no advance on its condition of last year, when it won a prize, and the other pattern, which was adapted for starting off the ground, failed to do so on this occasion. G. P. Bragg Smith also competed in this section, as he has done on former occasions, and his small model biplane flew very prettily. As in the case of the other competitor just mentioned, however, it showed no advance on last year.

A model entered by A. E. Cartledge flew fairly well, but was mainly interesting because constructed throughout of brass tubing reinforced with steel-wire bracing. So far as

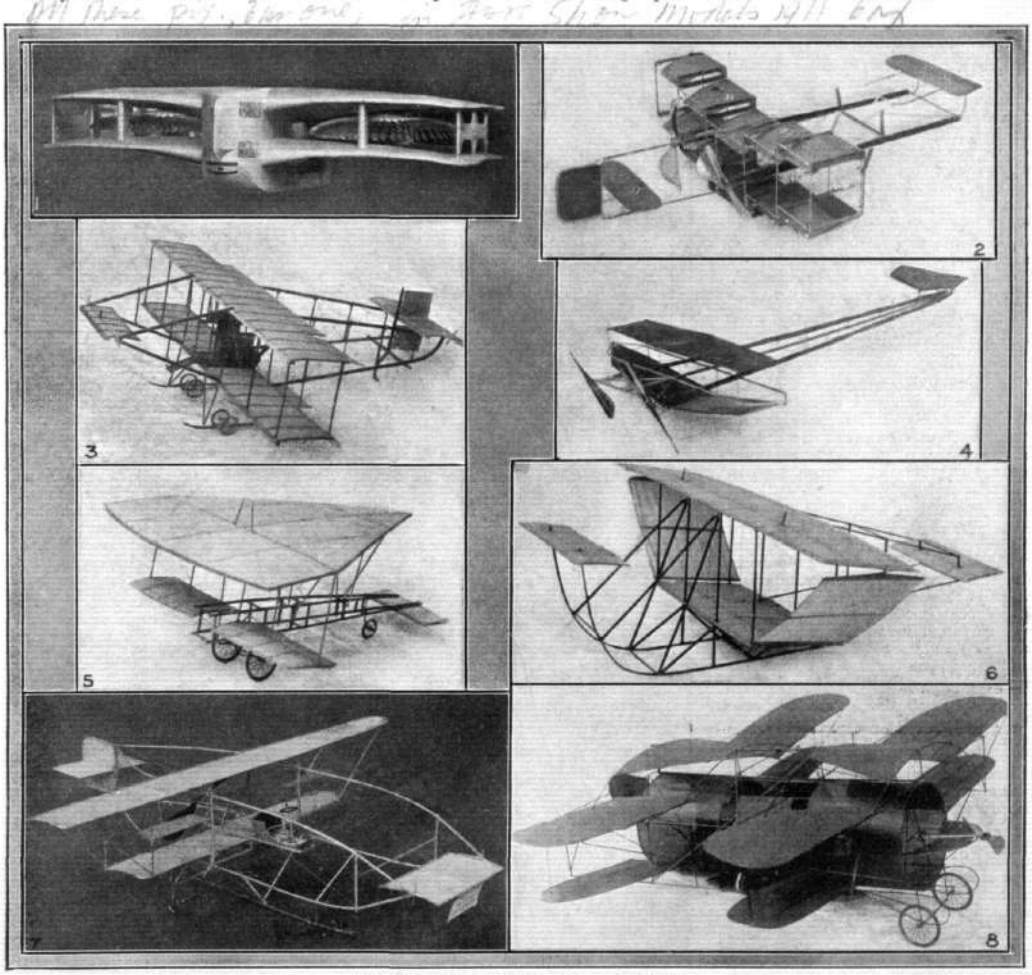
it demonstrated that a model made of these materials is capable of flight it succeeded in its purpose, but it is not quite clear what real significance there is in limiting the constructive work to them as a matter of principle.

Beyond the models mentioned none of the 70 exhibits took part in any actual demonstration of flight capacity.

In the section devoted to good workmanship, a model exhibited by G. P. Bragg Smith showed decidedly the greatest skill, although superficially some of the others might possibly please the eye better at first. Unquestionably, too, the second prize winners exhibited models of considerable merit, the scale model Blériot having a faithful reproduction of the wing framework, although being rather poor in some other details, such as the control wheel. The model exhibited by G. T. R. Hill was a biplane of the constructor's own design, and was also stated to be a successful flyer. It was extremely carefully and neatly made, and it was to be observed that the youthful builder gave the judges a thoroughly well-expressed explanation of its points. All the competitors are invited to explain their models to the judges, but many of them failed to turn up, which shows after all a lack of interest in their work. The Antoinette-type monoplane, made by the Brothers Startin, was another nice piece of work and at first sight the nearest approach to a scale-model of any well-known machine among the whole collection. Closer examination, however, revealed several discrepancies. But in any case there was not as much detail work in this model as in that which obtained first prize.

A few, but not many, other models may be said to have come within the range of prize-winning judged from the point of view of their workmanship, and notably, of course, the work on the Ding-Sayers flying model, and also the Jones, was of a very high order. A monoplane model exhibited by R. Holt was a very neat example of the use of magnalium tubing for the wing spars.

Although no prize was awarded for originality of design in connection with the models of aeroplanes, the special prize awarded to H. Burge Webb for the working model whirling-table was obviously based on the merit of his original idea, as distinct from the actual utility of this apparatus for the purpose of obtaining reliable data. The mechanism in question consisted of a small whirling-table, very ingeniously operated by means of a cord attached to a falling weight. The idea is one that deserves to be taken up by other model-makers, as it might quite likely lead to some interesting experimental research on a small scale.



MODEL BIPLANES AT OLYMPIA. "Flight" Copyright.

1. G. L. O. Davidson's "Gyropter." 2. H. M. McNeill. 3. S. C. Bone, model Howard Wright. 4. A. C. Cartledge all-metal construction. 5. W. Theinert. 6. A. H. Bailey, stability curtains. 7. R. Holt. 8. A. Henry, automatic equilibrium.

MODEL PRIZE WINNERS AT OLYMPIA.

1st Prize, Flying Model.

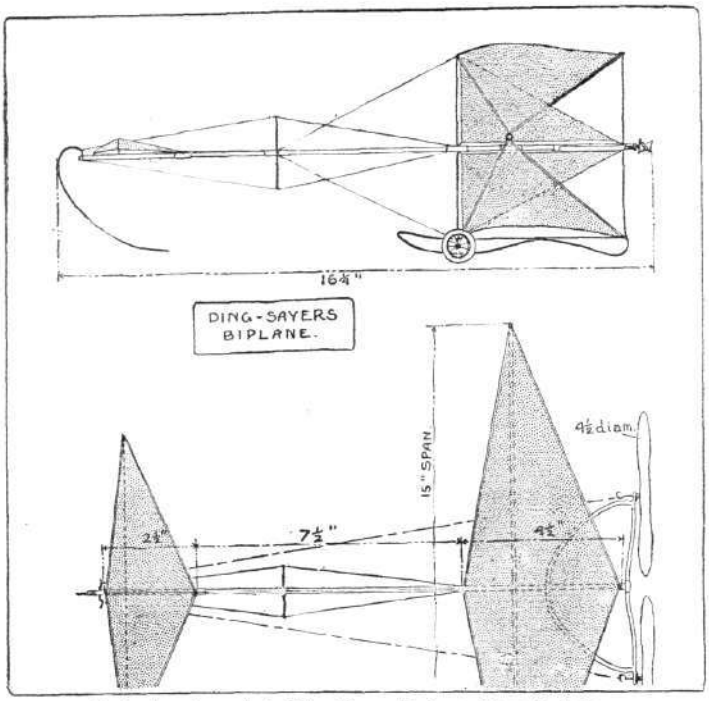
W. H. SAYERS (No. 46).

A very small Ding-Sayers biplane, fitted with running wheels to enable it to rise from the ground. The lower and upper planes are both of an elongated diamond shape in plan form but have a proper and inverted dihedral respectively, so that their extremities meet together and form a diamond-shaped gap in elevation. Between the main planes are two triangular-shaped vertical fins, and right in front is an elevator of diamond plan form, having a dihedral angle. At the rear of the main planes are two built-up propellers of 4½ ins. diameter. The planes, framework and propellers are all mounted on a central tubular girder, which is very efficiently trussed with wire and struts. This model rises from the ground after a run of a few yards and flies very steadily, covering a considerable distance for its size. It also flies very well when launched from the hand, and can be so adjusted as to fly in small circles. It will be noticed that a bent wire skid is arranged in front of the model, and this also acts as a shock absorber should the model land suddenly. Waterproof silk is used for covering the wings of this model, which weighs only 1½ ozs. complete.

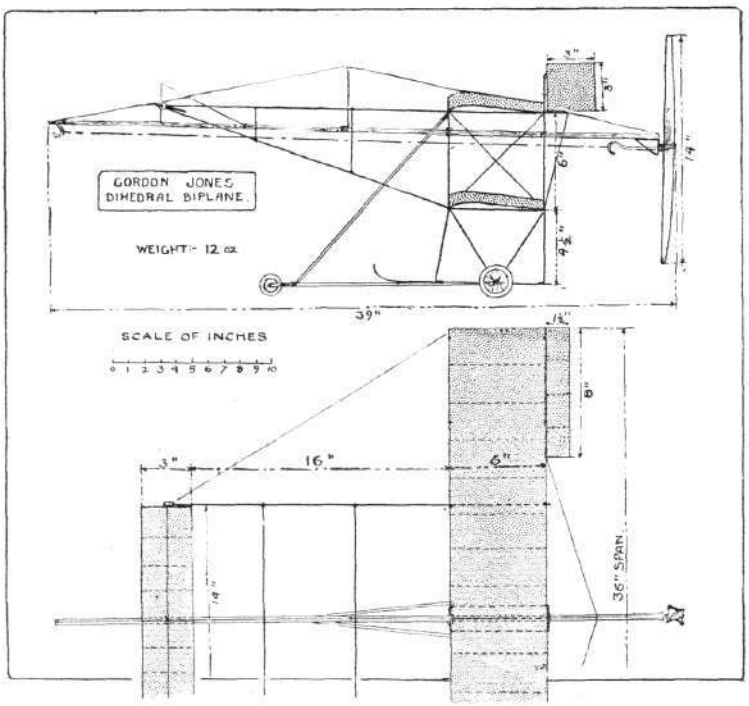
2nd Prize, Flying Model.

GORDON JONES DIHEDRAL BIPLANE (No. 35).

This model is constructed almost entirely of steel wire, the only wood embodied in it being the main girder carrying the rubber motor and a central skid carrying the forward running-wheel. The main planes, which measure 36 ins. by 6 ins., are cambered and are set at a considerable dihedral angle; they are covered with a very fine and strong silk. The top planes are fitted with two adjustable flaps, while at the centre of the rear edge is a rudder with a surface of 3 sq. ins. Immediately in front of the main planes is an elevator, measuring 14 ins. by 3 ins. A 14 in. rubber-driven propeller is situated immediately behind the main planes. This model weighs about 12 ozs. complete, and has a total supporting surface of just under 500 sq. ins. It rises from the ground after travelling about 5 yards or so, and, rising steadily at first, it finally takes a horizontal path and finishes with a graceful glide to the ground. The use of steel wire for its construction renders this model capable of withstanding a considerable amount of rough usage, in fact, when flying at Olympia during the competition, the model collided with some of the girders, and although it received some very hard knocks, no serious damage was sustained. It may be added that the designer of this model also builds models on similar lines in various sizes, and also one of the same dimensions as the prize-winner, where wood is employed for the framework in place of the steel wire.



Scale drawings of the Ding-Sayers biplane; 1st prize flyer.

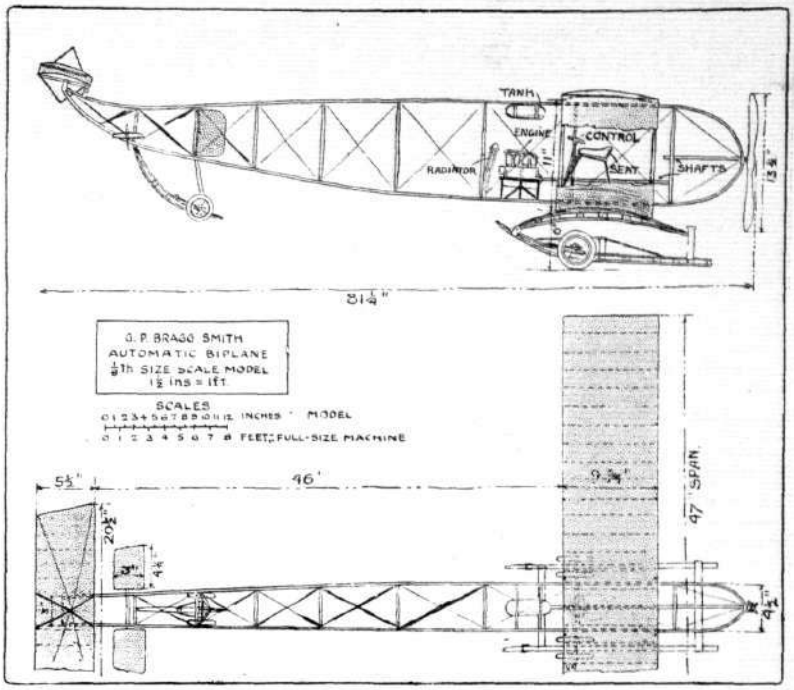


Scale drawings of the Gordon Jones dihedral biplane.

1st Prize, Workmanship.

G. P. BRAGG SMITH (No. 50)

A 1½ in. scale model of a full-sized machine in course of construction. The principal feature of this machine consists in the lower planes being so curved that the extremities join those of the upper horizontal plane, the theory being that as the machine tilts laterally a greater projected surface is presented on the side that needs it most, *i.e.*, the lower. Other features are as follows :—Main planes can be bodily removed from the fuselage, and the under-carriage is also easily dismantled. The pilot's seat is situated high up behind the engine between the main planes. The propeller is at the rear, and there is a fixed monoplane right in front ; this latter, which has a dihedral angle, can be adjusted. Just behind the leading plane is the elevator, which is in line with the middle of the gap. The fuselage is purposely kept narrow so that the head resistance is concentrated as near the centre as possible. Situated at the front of the fuselage is a very neat skid carrying a running wheel, which would prevent any damage occurring should the machine come down head first.

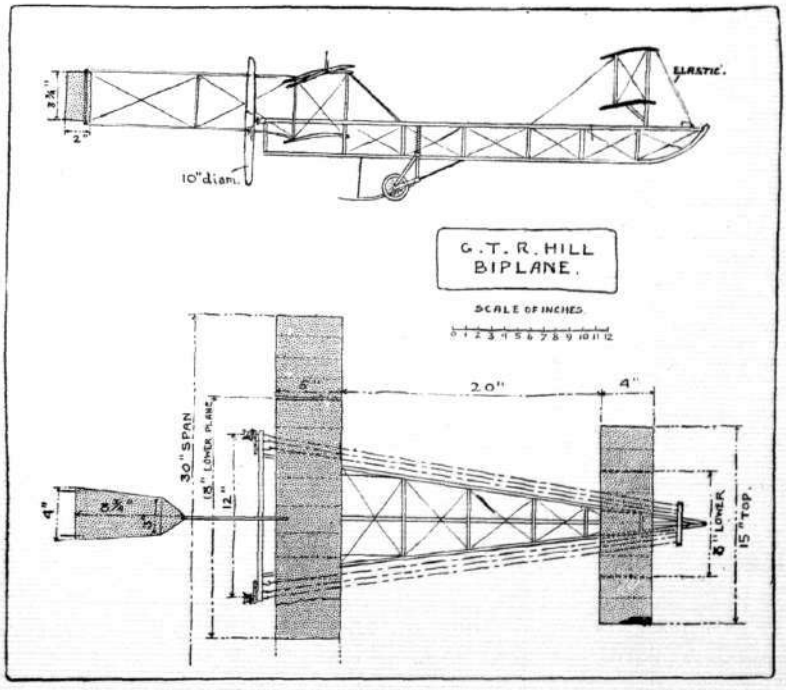


Scale drawings of the G. P. Bragg Smith biplane.

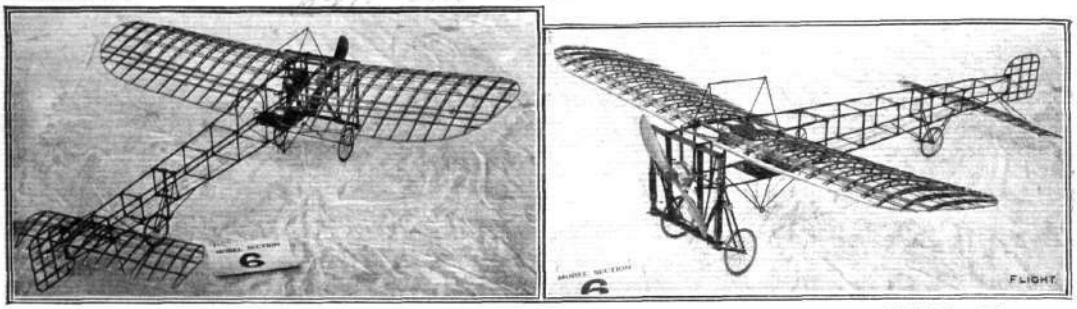
2nd Prize, Workmanship.

G. T. R. HILL (No. 31).

A model biplane of somewhat original design and very careful workmanship, the covering of the planes being especially well done. The top plane carries an extension at each extremity, and the angle of incidence of these extensions can be varied. Both main planes are neatly built up, and are double-surfaced with silk fabric. They measure 30 ins. top, 18 ins. bottom, and 5 ins. fore and aft. At the forward end of the triangular fuselage is a biplane elevator, the top plane being 15 ins. by 4 ins., and the bottom plane 8 ins. by 4 ins. Both planes are double-surfaced, and they are controlled from the pilot's seat between the main planes. Close behind the latter is a biplane tail 8¾ ins. long and tapering from a point to 4 ins. in width. Between the two tail planes are two rudders, each 3½ ins. by 2 ins. The model is driven by two propellers situated behind the main planes, and each geared to three lengths of elastic of four strands each. A neat under-carriage of the Blériot type is fitted, but with skid additions. This model weighs 12 ozs. and has a total area of 328 sq. ins. It has flown 310 ft.



Scale drawings of the Hill model biplane.



"Flight" Copyright.

Two views of a scale model Blériot built by Willyboldt Birkinger, which gained second place for construction.

2nd Prize, Workmanship—W. J. AND H. E. STARTIN (No. 52).

A 1½ in. scale model of an Antoinette monoplane, constructed from scale drawings in FLIGHT. This model is constructed entirely of walnut and birch. The front portion of the fuselage is of wood as in Antoinette practice, while the rear portion is covered with fabric. The double-surfaced wings are beautifully built up in orthodox style—two spars, the thin ribs having distance blocks in between; the fabric used is Continental. The weight of this model is 3½ lbs., including 6 ozs. for the small three-cylinder steam engine. The latter is only a temporary fitting, but the makers are building a small steam plant with a flash generator for driving this model. In this model the landing chassis is an alteration on the original to obtain greater strength, the model being intended for use.

2nd Prize, Workmanship.—WILLYEOLDT BIRKINGER (No. 6) ½ scale model Blériot. This model is shown without the fabric attached, showing the method of construction very clearly. There is a large amount of work in this model, especially in the wings, where the Blériot method of construction and details have been very closely copied.

INTERNATIONAL MICHELIN CUP, 1911.

SUMMED up in ordinary language the International Michelin Cup for 1911 is a cross-country, long-distance circuit competition, the principal feature of the rules being that the minimum speed shall *exceed* 50 kiloms. an hour, calculated on what the French very practically call "the commercial distance" of the circuit. This commercial distance is simply twice the distance as the crow flies from point to point. The points, A and B, to and fro between which the competitor must fly, may be any distance between 50 and 100 kiloms. apart, and the competitor may select any locality he pleases for the event, so long as it takes place near a big town. Also, the competitor must defray the expenses of the erection of suitable mark-posts, but there is apparently nothing in the rules to prevent any one choosing two natural landmarks for this purpose, always providing, of course, that the choice is sanctioned on general principles by the governing officials.

A most important feature of the new regulations is that competitors may descend when and as often as they please to take fuel on board or to make repairs. On the other hand, they must not replace any part of the machine that is sealed by the officials. Also, they must make up lost time before the completion of that same circuit in which they descend, for should the speed of that circuit fall as low as 50 k.p.h. their effort is automatically brought to a conclusion. The following is a summary of the new rules:—

The holder of the International Michelin Cup for 1911 will be the pilot of an aeroplane which, fitted with one or more seats and before November 1st, 1911, has covered the greatest distance over a closed circuit. This distance must exceed 582·935 kiloms. At the time of his entry the competitor must state two points which can be seen on a map in the proximity of a large town and distant not less than 50 and not more than 100 kiloms. from each other, and he must at the same time say from which point he proposes to start. Should the proposed course be more than 1,000 kiloms. from the town in which the responsible club has its headquarters, one day will be added to the notice required for every 1,000 kiloms. distance.

Before the commencement of the flight the responsible official will place, at the expense of the aviator, two posts or marks as near as possible to the points indicated by the entrant. He will then measure the distance between them and calculate the time which would be taken to cover twice this distance in a straight line at a "commercial" speed of 50 k.p.h. The timekeeper will also mark on the ground a starting line, which shall be a prolongation of an imaginary line between the two mark-posts, and an official observer must be stationed at each mark-post as well as the timekeeper at the starting line. The distance will be counted according to the number of laps completed by the aeroplane recrossing the starting line in full flight. Landings and replenishments are authorised, but the time taken will be counted in time for the lap, and that time must not equal or exceed the time calculated by the timekeeper as representing the commercial speed of 50 k.p.h. During the whole of the flight the entrant must be on board, and the aeroplane must not be changed. The important parts, such as the cylinders of the motor, propeller, the wings, main spars, &c., will be sealed before the start, and the official observer will be required to verify these at the conclusion. Should two aviators succeed in covering the same distance the trophy will be awarded to the aviator who does the best time.

Entries should be made before 4 o'clock on the day preceding the attempt, and an entry is good for four days. The entry fee is 100 francs.

A Strange Coincidence.

BY an extraordinary and most unhappy coincidence the accident which befell Mr. H. M. Maitland recently while flying over Salisbury Plain occurred at almost exactly the same spot where his brother, Capt. E. M. Maitland, fell last August. It will be remembered too, that Capt. Maitland in like manner also broke both his legs as the result of a fall from a biplane.

In regard to the cause of the accident, the Bristol Company inform us that it was in no way due to the engine failing. They write us as follows: "Mr. Maitland had completed a full right-hand turn, and, so far as we could see, was attempting a second turn, and failed to correct the tendency of the machine to fly upwards, with the result that he fell to the ground; but he had perfect control of the machine until he was within 50 or 60 feet of the earth, and the accident would probably not have occurred had he not made a miscalculation in attempting to make the second right-hand turn."

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

THE rules for the Manville Prize are republished below, in view of the opening of the competition on Monday next, April 17th. The time value scale referred to in Clause 1 appeared in FLIGHT, April 8th, page 314.

The Manville £500 Prize.

(Under the Rules of the Royal Aero Club and the Federation Aeronautique Internationale.)

Mr. E. Manville has presented to the Royal Aero Club of the United Kingdom a sum of £500 for competition by British aviators on an all-British aeroplane, under the following conditions :—

1. The winner to be the aviator who, on an aeroplane, accompanied by a passenger (combined net weight to be not less than 20 stones) remains the longest aggregate time in the air, valued in accordance with the scale attached. The flights must be made on nine specified dates.

2. The flight must be confined to the British Isles, and may be made at any flying ground previously approved by the Club for this purpose.

3. The prize will be open for competition between the hours of 10 a.m. and 5.30 p.m., on the following nine dates :—

Monday	...	April 17th	Saturday	...	June 24th
Saturday	...	May 6th	Saturday	...	July 15th
Saturday	...	May 20th	Monday	...	August 7th
Monday	...	June 5th	Wednesday	...	October 4th
Saturday	...	June 17th			

and in order to qualify for the prize the competitor must have remained in a continuous flight with his passenger for at least 15 minutes on at least half the days on which any competitor shall have made a recorded flight in this competition.

4. No flight of less than 15 minutes will be taken into account, and the amount credited to each competitor on account of each continuous flight will be in accordance with the scale attached to these regulations. Completed minutes only will count.

5. The competitor must obtain certificates, each of which must be signed by the official timekeeper, or by another timekeeper who shall have been approved for this specific purpose by the Royal Aero Club, stating the exact duration of each flight. Certificates must be posted to the Secretary, Royal Aero Club, 166, Piccadilly, London, W., within three days of the date of the flights.

6. The entrant, who must be the person operating the machine, must be a British subject flying on a British-made aeroplane, must hold an aviator's certificate, and be duly entered on the Competitors' Register of the Royal Aero Club.

7. The complete machine and all its parts must have been entirely constructed within the confines of the British Empire, but this provision shall not be held to apply to raw material.

8. Entries must be made in writing to the Secretary, Royal Aero Club, 166, Piccadilly, London, W., and must be accompanied by an entrance fee of £1. The competitor must make his own arrangements with regard to timekeepers, whose names must be sent in to the Royal Aero Club 48 hours prior to the attempt.

9. Should any questions arise at any time after the date of entry as to whether a competitor has properly fulfilled the above conditions, or should any other question arise in relation to them, the decision of the Committee of the Royal Aero Club shall be final and without appeal.

10. A competitor by entering waives any right of action against the Royal Aero Club or Mr. E. Manville for any damages sustained by him in consequence of any act or omission on the part of the officials of the Royal Aero Club or Mr. E. Manville, or their representatives or servants, or any fellow competitor.

11. The aeroplane shall at all times be at the risk in all respects of the competitor, who shall be deemed by entry to agree to waive all claim for injury either to himself or his aeroplane, or his employees or workmen, and to assume all liability for damage to third parties or their property, and to indemnify the Royal Aero Club and Mr. E. Manville in respect thereof.

12. The Committee of the Royal Aero Club reserves itself the right to add to, amend or omit, any of these rules should it think fit.

HAROLD E. PERRIN.
166, Piccadilly. Secretary.

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Paddington Gliding Club (118, ELGIN AVENUE, W.).

THE club's glider is to be tried during the Easter holidays, and has been placed at the disposal of all the members. Therefore, any gentleman wishing to join the club should do so soon. The entrance fee is 2s. and the subscription is 3*d.* per week.

Mr. C. W. Tinson has very kindly consented to draw out the plans of the new glider which, it is hoped, will be put in hand shortly.

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SCHOOL AERO CLUB.

Arundel House School Ae.C. (15, ARLINGTON ROAD, SURBITON).

ON Monday, the 3rd inst., the club records for longest flight and duration were broken by C. K. Scarf at the Long Ditton Aerodrome, his model, the "Scarf" monoplane No. 32, accomplishing a straight flight of 1,470 feet in 60 seconds.

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ADVISORY COMMITTEE FOR AERONAUTICS.

REPORTS AND MEMORANDA, No. 19.

THE most extraordinary book yet published relating to the subject of aeronautics, or for that matter the most extraordinary work that is likely to be published for some time to come, is No. 19 of the Reports and Memoranda that the Advisory Committee issue in addition, or as an appendix, to their ordinary Blue-Books. This particular report has been made by Sir G. Greenhill, and is on the "theory of a stream line past a plane barrier, and of the discontinuity arising at the edge, with an application of the theory to an aeroplane."

There are precisely 34 lines of introductory text, which may be described as reading matter : the remainder consists of over 90 pages of solid mathematics, and each page is the size of a sheet of foolscap. It is one of the most remarkable accomplishments in this direction that we have ever seen, and if it is completely unintelligible to 9,999 people in every 10,000 that in no way discounts its plausible utility to the one superior mind that is capable of working upon the data there provided. As a matter of fact, Sir G. Greenhill has taken upon himself the probably thankless task of collecting together all the different analytical methods of any value relating to this subject, which is of an apparently academic interest when treated in this way, is nevertheless one of fundamental importance in the science of flight. Roughly speaking, it may be described as a mathematical investigation of the phenomena that may be experimentally demonstrated by blowing smoke at an inclined plane. It is not quite limited to this particular case, which is, however, the best we can do for the present by way of illustration. When we say that Sir G. Greenhill has performed a thankless task we predict no more than is likely to be true, for the great majority of the students of flight are totally incapable of abstracting any practical information from the thesis in question. Nevertheless, the author has performed in an apparently wonderfully able manner a task for which he was uniquely suited and one that possibly in some measure he may have regarded as coming within his conscientious duty to undertake for the benefit of the few who come after. It is no light task to collect and collate different theories on even quite simple subjects, but when it comes to the question of making an orderly array of the mathematical analyses propounded by Helmholtz, Kirchhoff and others on a subject that even to the average mathematical mind is one of utmost complexity, it is difficult to adequately express a proper appreciation of the accomplishment.

We should like to suggest that some other equally able member of the Advisory Committee write a non-mathematical treatise for the next Blue-Book explaining in words instead of signs the practical deductions that may be drawn from Reports and Memoranda No. 19. Having done this someone else may perhaps then feel inclined to take up the running where Sir G. Greenhill leaves off, by tackling the little problem that is so gently insinuated by the author in the short concluding paragraph of his work, which reads as follows :—

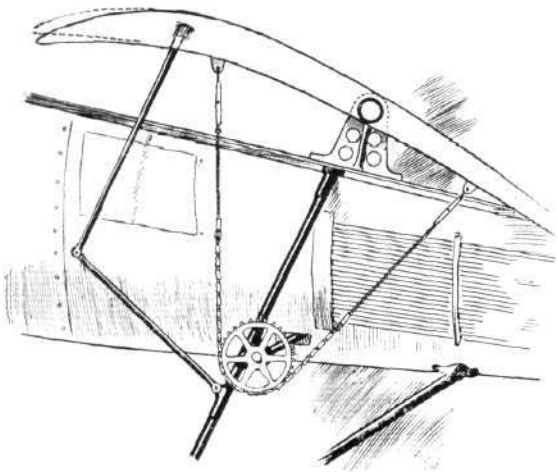
"A square and rectangular plate or orifice would require a further investigation of *greater* complexity ; and many similar problems may be cited as awaiting an analytical treatment by a pioneer pathfinder in mathematical research."

The italics are ours.

BRITISH NOTES OF THE WEEK.

Aviation at Southport.

ALTHOUGH the Southport Town Council has decided to have nothing to do with the exhibition of flying which it is proposed to give during Coronation week, several members of the Town Council have formed a committee and are determined to carry the matter through. A guarantee fund has been started, and already nearly half of the £3,000 required has been promised. Arrangements have been made with Mr. Grahame-White to give a four days' display—on June 22nd, 23rd, 24th and 26th—at a fee of £2,000.



"Flight" Copyright.

Sketch showing how the wings on the Mulliner "Kny" aeroplane are mounted on a central bearing so that the angle of incidence can be altered during flight. Simultaneous with this movement an alteration in the camber is brought about by means of pivoted rods, as shown above, acting on a special flexible leading edge.

He will take two machines to Southport, as well as a competent aviator. It is proposed also to arrange for balloon ascents and parachute descents by Capt. Spencer, while a military band will also be engaged.

M. Ducrocq Flies by Moonlight.

RISING from Brooklands Aerodrome at a quarter to ten on Friday of last week on his Farman biplane, M. Maurice Ducrocq, after circling round the grounds twice, flew off to Chertsey and continued to Addlestone and Woking, returning to Brooklands at half-past ten, where he concluded his flight with a fine *vol plané*. The only indication of M. Ducrocq's landing place was a small bicycle lamp on the ground. On his descent he reported that in the moonlight he had had little difficulty in keeping his direction, and maintained an average altitude of 800 ft. This flight is claimed as a record one.

Vickers, Ltd., and the R.E.P.

IN connection with the announcement that is being given so much publicity of late regarding the concession of the exclusive rights of M. R. Esnault-Pelterie's inventions to Messrs. Vickers, Ltd., for exploitation in Great Britain and the Colonies, these rights were granted as far back as the first day of this year.

A Serious Loss to Aviation.

WE understand that the fire which occurred in a studio on the New Forest estate of Lord Montagu of Beaulieu will mean a serious loss to aviation, as there was being prepared in the studio a most elaborate and perfect system of maps and charts for aeronautical purposes. As soon as the outbreak was discovered the fire brigade was summoned and got to work, but unfortunately the inflammable nature of the materials used in the map-making rendered the task of dealing with the outbreak very difficult.

And the Pity of It!

THE First Lord of the Admiralty, last week in Parliament, in reply to Mr. Lionel de Rothschild, M.P., not only definitely stated that the Navy did not own any aeroplanes at the present moment, and had none on order; but, questioned by Mr. Arthur Lee, M.P., as to whether the settled policy of the Admiralty was to have nothing to do with aeroplanes, Mr. McKenna said that he could not say anything about their permanent policy, but that so far as experimental work was concerned the War Office had undertaken the aeroplane branch and the Admiralty were undertaking dirigibles.

A Useful Addition to the Hangar.

WHILE experimenting with flying machines there is always a good deal of repair work of one sort or another to be done, and the practical aviator will be anxious to carry out as much of this as possible himself. With this end in view he will find it most economical in the end to instal in a corner of his shed a small lathe. Messrs. Drummond Bros., of Ryde's Hill, Guildford, make several lathes eminently suited for this purpose, and they will be pleased to send full particulars to anyone on application.

"Flight" Copyright.

Sketch of Rubery, Owen and Co.'s safety spring wire-tightener.

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FROM THE BRITISH FLYING GROUNDS.

Laffan's Plain.

THERE has been no flying here during the past week. The weather has been unsuitable for anything except kite-flying, a good deal of which was done in exceptionally high winds by the Army Balloon Section.

New ailerons are being fitted to the Cody biplane—much lighter and more efficient than those that have been removed. It is anticipated that great additional speed will be obtained by this improvement.

London Aerodrome, Collindale Avenue, Hendon.

Blériot School.—Although five new pupils joined the Blériot School during the past week, owing to the very bad weather work had to be confined to the technical part only, as no flying was possible for novices.

The new two-seater military type 70-h.p. Gnome-Blériot which has arrived from the Olympia Show, where it was much admired, is ready to go out as soon as the wind abates. Several officers, and also a delegation of Japanese gentlemen, came to see it on Saturday and seemed delighted with its appearance.

Everyone at Hendon is, of course, anxious to witness its first flight, as it is the first monoplane of this type that has come to England, and the reputation it has already made in the hands of the French officers is more than sufficient to create the keenest interest.

Lieut. Cammell, who will fly this machine, was on the ground, but wisely decided not to take it out for the first trial in such a gale as was blowing all Saturday afternoon, even to demonstrate the scouting qualities of the model.

Salisbury Plain.

OWING to the recent stormy weather there has been practically no flying to record with the exception that on Saturday M. Tabuteau was out for a little while. The variable currents, however, rendered flying very tricky work, but M. Tabuteau is a master of his Bristol biplane. During this spell of enforced idleness, the work of tuning up the various Bristol machines has been actively carried on in the sheds while the pupils have also been given extended instruction indoors.

Foreign Aviation News.

All Passengers Must be Full Weight.

In view of the extraordinary performances which have been made recently with several passengers on a machine, and the claiming of records in connection therewith, the French Commission Sportive Aeronautique has decided that in order to obtain official recognition of such records every passenger taking part in record attempts must be not less than eighteen years of age and must be of a minimum weight of 75 kilogs.

More Passenger Records Passed.

Official recognition has been given in France to the world's records with three and four passengers made by Busson on a Deperdussin monoplane at Betheny on March 10th last. The distance and duration records with three passengers were 50 kiloms. in 31 mins. 23⅘ secs., while with four passengers the figures were 25·74 kiloms. in 17 mins. 28½ secs. The highest speed attained with three passengers was 96·308 k.p.h., and with four passengers 87·251 k.p.h. The other records recognised were as follow :—

Pilot and Three Passengers.—10 kils., 6 mins. 16⅘ secs. ; 20 kils., 12 mins. 34¼ secs. ; 30 kils., 18 mins. 48 secs. ; 40 kils., 25 mins. 5⅗ secs. ; 50 kils., 31 mins. 23¼ secs.

Pilot and Four Passengers.—5 kils., 3 mins. 34 secs. ; 10 kils., 7 mins. 8 secs. ; 20 kils., 14 mins. ⅘ sec.

M. Deutsch de la Meurthe takes the Air.

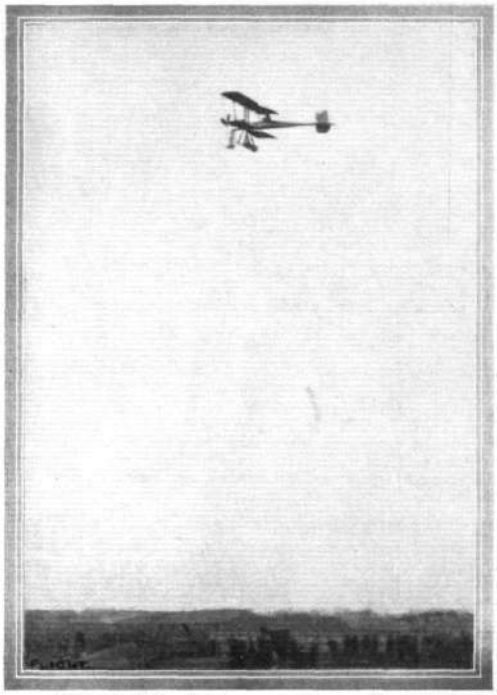
M. Deutsch de la Meurthe, who has done so much to encourage aviation in France, has at last flown in an aeroplane, having been taken on Sunday afternoon for half-an-hour's jaunt on a Blériot monoplane by Alfred Leblanc. Leaving the Blériot aerodrome at Pau, the couple travelled in the direction of the city and, passing over it, went on to visit the ground where the dirigible "Ville de Pau" has its quarters, and also made a demonstration over the other flying grounds in the neighbourhood. M. Santos Dumont was also visiting Pau on Sunday and with M. Deutsch witnessed Alfred Leblanc attain a speed of 140 kiloms. per hour.

Bathiat to Try for the Deutsch Prize.

Bathiat has now transferred his Sommer monoplane to St. Cyr, where he proposes practising with a view to making an attempt to win the Deutsch Prize, which calls for a circuit of 200 kilometres, passing over Meaux and Melun, to be covered three times.

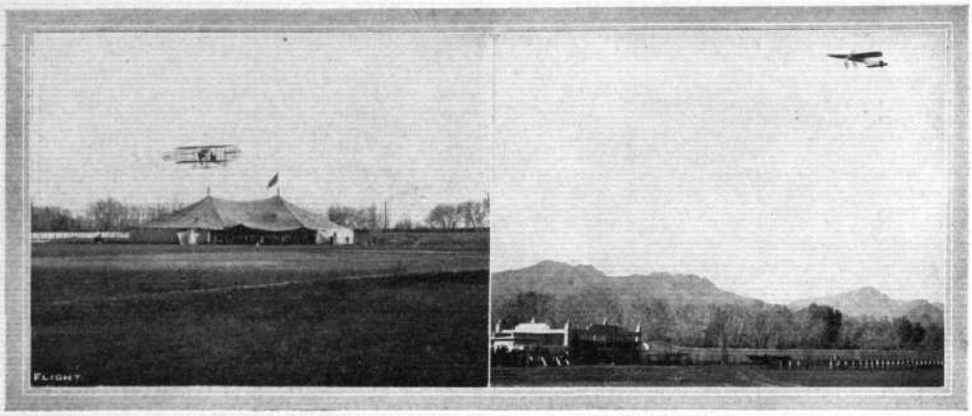
The Cause of Cei's Accident.

In recording the fatal accident to Cei, our French correspondent did an injustice to the Anzani motor with which the biplane was fitted in attributing the accident to its failure. Those who witnessed the accident remarked that the engine suddenly stopped, and it was thought that it had failed, but a subsequent examination made by the well-known French consulting engineer, Lucien Perisse, a copy



AT DOUAL.—A Breguet biplane in the air.

The Morane monoplane on which M. Vedrines last week accomplished his splendid flight from Poitiers to Issy in 2 hrs. 12 mins.



"INTERNATIONAL AVIATORS" IN AMERICA.—On the left, Hamilton starting away for his scouting trip on the Mexican frontier. The "hangar" is where the machines rest. This holds comfortably twelve machines, which are roped off for exhibition purposes. On the right, Rene Simon is seen at El Paso returning from his trip over the Mexican insurgents' camp.

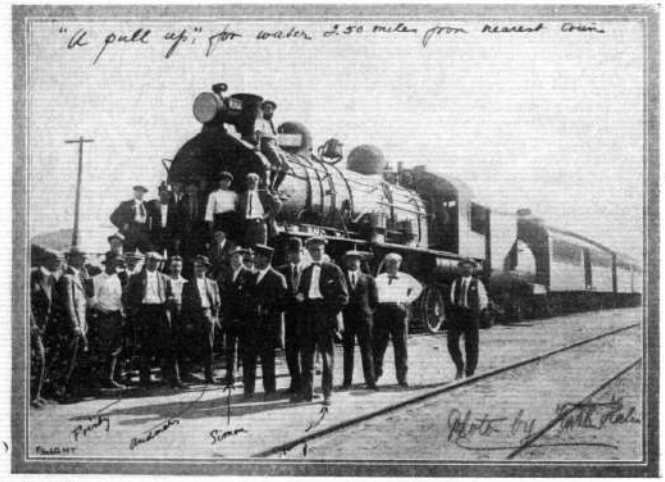
of whose report reaches us from the constructors of the Anzani engine, has furnished ample evidence that the aviator must have stopped the engine himself. The accident was apparently due, therefore, to the exceedingly steep angle at which the aviator was trying to glide down in order to land on the restricted space beneath him on the Ile de Rothschild.

Marseilles to Algiers.

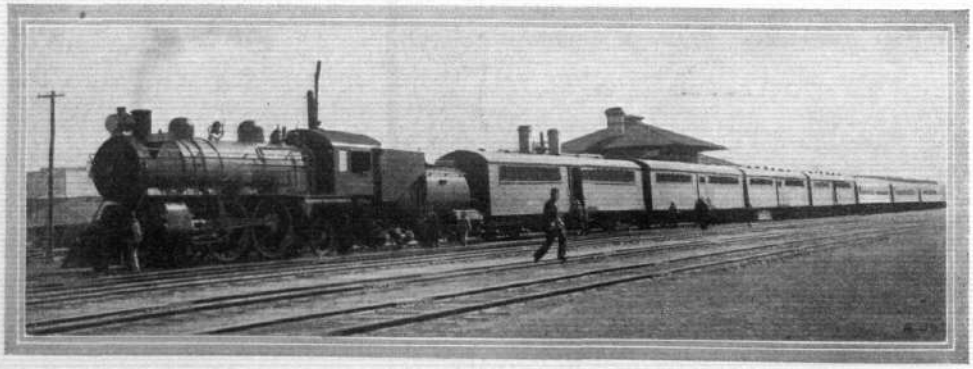
OUR French contemporary *L'Aero* is actively organising a trans-Mediterranean flight from Marseilles to Algiers. Tentatively it has been decided that the start shall take place from Marseilles on Aug. 13th, the competitors resting on the island of Minorca on the following day, and flying the concluding stage to Algiers on the 15th. Prizes will be given for the best performance during each stage of the flight as well as for the complete journey.

Five Fly Across Country on a Sommer.

CONTINUING his series of experiments in passenger carrying, M. Sommer, on the 8th inst., carried four full-grown persons besides himself on his biplane from Douzy to Bazeilles and Mouzon and back, covering a distance of about 20 kiloms. The passengers were Princess de Croy, Lieut. Guitaut, Lieut. Malherbe and Daillens.



The Pilots attached to the Tour of "International Aviators" in America.—A halt of the special train for water.



THE "INTERNATIONAL AVIATORS" IN AMERICA.—How the "Circus" travels round the country. The special train which conveys the aeroplanes, aviators, and staff.

A Long Flight on a Sommer Monoplane.

LEAVING Breuvannes, close by Chaumont, on the 7th inst., on his Sommer monoplane, Kimmerling flew to Macon, covering the 240 kilometres at a speed of about 110 k.p.h. He tried to land in some fields at Breuil on the borders of the Saone, but was caught by a gust of wind and fell from a height of 20 metres, the machine being considerably damaged although Kimmerling fortunately escaped serious injury.

Passenger Carrying on a Hanriot.

USING an ordinary Hanriot monoplane fitted with a 60-h.p. Aviatic engine, the Hanriot pilot Lenfant carried three of his pupils for a lengthy trip on the 6th inst. The pilot himself weighed 78 kilogs., while the other three weighed 79, 71, and 68 kilogs., respectively. In addition, 32 kilogs. of fuel and oil were carried, making the total load 328 kilogs.; and as the machine itself weighs 450 kilogs., and has a supporting surface of 22 sq. metres, it will be seen that the performance was a meritorious one.

Nice to Monte Carlo and Back.

ON the 6th inst. Vidart, on his Deperdussin monoplane, made a flight from Nice to Monte Carlo and back. He circled several times above the Casino at Monte Carlo, much to the delight of the crowd of visitors.

French Gordon-Bennett Eliminating Trials.

THE Aero Club of France will hold their eliminating races for the Gordon-Bennett Aviation Trophy during the first fortnight of June, and the regulations under which they will be held will be announced shortly.

Testing the Deperdussin Monoplane.

A FEW days ago Col. Bouttieaux paid a visit to the Deperdussin works in order to witness some experiments being carried out with the material of which the monoplanes are constructed. One of the most remarkable of these tests consisted in placing a load of sand upon the wings equal to six times and a half the normal weight of the machine in running order with pilot, passenger and sufficient supplies for a flight of three hours. Notwithstanding these severe conditions, there was no permanent deformation to be detected at the conclusion of the test.

Aix la-Chapelle to Liege.

ON Sunday the Belgian aviator Lescart, accompanied by Benselin, succeeded in flying back from Aix-la-Chapelle to Liege on his Farman biplane. They had rather a thrilling experience, and while crossing the Forest of Hertogenwald the aeroplane was very much tossed by the wind. The aviators also encountered a bank of fog and were compelled to land about ten kiloms. short of Liege, being, however, able to continue and complete their journey later in the day.

Flying at Dusseldorf.

AT a meeting organised by the local Aero Club at Dusseldorf, Herr Hans Grade on his monoplane made a flight of 16 mins. above the aerodrome, while Dr. Hoos on his little Gefa monoplane was in the air for 20 mins. So successful was this meeting that it is proposed to organise another one of similar character.

Cross-Country Flying in Algeria.

WHAT is claimed to be the first cross-country flight in North Africa was carried out on the 7th inst., when M. Bonnet Lebranche, on his two-seated aeroplane fitted with a 50-h.p. Anzani engine, flew from Oran to Tlelat, a distance of 68 kiloms., the height maintained during the trip averaging about 450 metres.

American G.-B. Trials.

THE Aero Club of America has announced that the eliminating trials to select the team of three American representatives for the Gordon-Bennett Aviation Cup will be held at Belmont Park on May 19th to 21st.

With "International Aviators" Through America.

AN interesting communication and photographs reach us from Mexico City from Mr. Ernest C. Newman, mechanic to the late J. B. Moisant, with whom Mr. Newman left England on September 17th last, and has since been touring with "International Aviators" in America. Curiously Mr. Newman previously was also assisting the late Mr. Cecil Grace in his work, and was a witness of the disaster at Bournemouth to the Hon. C. S. Rolls. Mr. Newman concludes his letter by stating that they have visited no less than 16 large cities during the past four months, such as Richmond (Virginia), Memphis (Tennessee) Tuplo (Missouri), New Orleans (Louisiana), Dallas (Texas), Oklahoma City, Waco (Texas), San Antonio, El Paso (both of Texas), Monteray and Mexico City (of Mexico), and from there they left for Cuba. The company have their own special train of four cars for machines, two sleepers and dining, photographs of which are reproduced on the preceding page.

American Flyers in Japan.

THE American aviators J. C. Mars and Capt. T. S. Baldwin have been visiting Japan, making both at Osaki and Tokio very good flights. On the opening day of the three days exhibition at Osaki, there was an assemblage of 400 000 people to witness the three good flights made. Among those present was Prince Kuniyoshi Kuni, a grandson of the Emperor, who complimented the flyers on their performance.

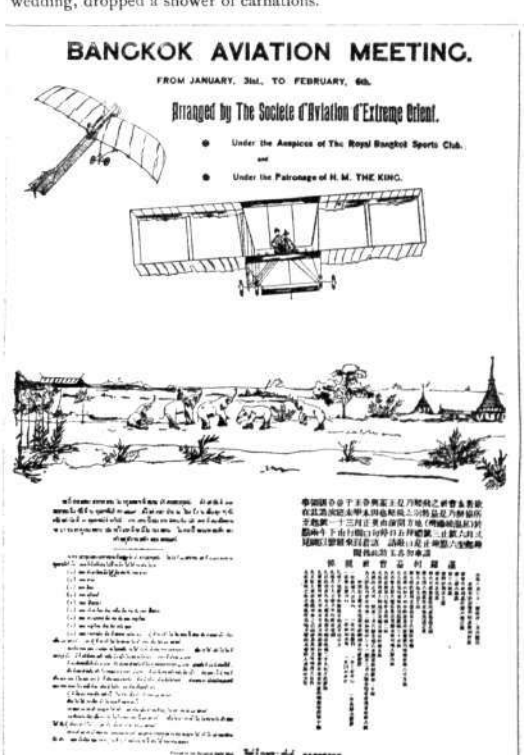
AIRSHIPS AND BALLOONS.

The Gordon-Bennett Balloon Race.

THE Aero Club of America has decided upon Kansas City as the starting point for the Gordon-Bennett Balloon Race which will be held on October 9th. A prize of £1,000 will be awarded to the winning pilot by the City of Kansas. If eliminating trials are necessary they will be held at Omaha.

"Deutschland II" on Trial.

WITH Count Zeppelin in charge, the Zeppelin airship "Deutschland II" left Friedrichshafen at 25 minutes past 8 on the 7th inst. and arrived at Stuttgart at a quarter to one. She landed there to change passengers and afterwards continued her journey over Carlsruhe and landed at Oos at ten minutes past four, having carried ten passengers. When passing over the Royal Palace at Stuttgart, Count Zeppelin, by way of paying homage to the King and Queen of Wurtemberg, who were celebrating their silver wedding, dropped a shower of carnations.



FLIGHT IN THE FAR EAST.—A notice placard of the Bangkok Aviation Meeting held from January 31st to February 6th last.

STREAM LINE BODIES ON AEROPLANES.

TAKEN back to their real beginning, the enclosed bodies introduced on so many of the aeroplanes at Olympia this year may be said to have evolved from the little tin shields that some aviators fit to the levers of their Farman type flyers, in order to keep their hands warm. Practical considerations rather than theoretical advantages are the governing factors in most new moves of this kind, but although there is very little doubt that most of the aeroplane bodies have been built primarily in order to make flying somewhat less uncomfortably cold in the winter, nevertheless there is, as we recently pointed out, an important theoretical aspect to their use, which should not be neglected.

When the bodies are of suitable shape they come within the category of stream line forms, which means that their resistance to axial motion through the air is purely one of skin friction, in which the factor of normal pressure (or impact resistance by flat surfaces) is absent altogether.

The formula for estimating the normal pressure of flat planes is given by the expression $R = \cdot 003V^2$, whereas the formula for skin friction may be approximately given as $R = \cdot 000018V^2$.*

It will be observed that these two formulæ are alike in kind; it is, therefore, possible to compare the relative resistances by direct equation of the significant constants. Thus skin friction is represented by the value ·000018, which is only $\frac{1}{166}$th of the value ·003, that represents the resistance due to normal pressure. In other words the normal pressure on flat planes of 1 sq. ft. area facing the wind is equal to a skin friction on a plane of 166 sq. ft. area edge on to the wind. This takes into account the friction on both sides of the plane, that is to say, the skin friction on a double surface of 332 sq. ft., so that if the normal plane were enclosed in a stream line casing, which presents only its external surface to the wind, 332 sq. ft. of material would be available for the purpose without, theoretically, increasing the resistance.

It is worth while to consider one minor point in stream line formation, and that is the possible advantage of using a hemispherical head rather than one with a more pointed entry. There is reason to suppose that the trailing portion of a stream line form is more important than the entry, consequently it is preferable to compromise on this latter part if anywhere. A varying relative wind necessarily introduces a compromising factor into the problem whatever may be the structural accuracy of the casing itself, and inasmuch as the hemispherical head presents an approximately equal shape throughout a wide range of aspects, it would appear to be worthy of support from this consideration alone. From the constructional point of view, also, the hemispherical form is often the most convenient. By the use of the term hemispherical it is not necessarily implied that the pure hemisphere need be used or that the casing should necessarily have a circular cross section. The idea of a stream line form is, as has been explained, merely a device for converting normal pressure into skin friction, in order to take advantage of the reduced coefficient of the latter form of resistance, and it is immaterial what the cross section of the casing is so long as its contour conforms to the fundamental principles of the stream line theory. It does not, for instance, necessarily follow that the pilot and the engine, when situated side by side as on a Wright biplane, could not be satisfactorily enclosed in a stream line casing without altering their relative positions and also without making an unduly clumsy job of the construction.

In connection with such casings it is a point of considerable importance to know how long they should be for greatest efficiency, and this matter is all the more interesting because there is a natural tendency to case in the tail outrigger so that it forms part of the stream line formation. It is a moot point whether this is an altogether advantageous proceeding. Stream line forms for air can be bluffer than those for water, where the ratio of length to breadth may be taken as, say, 7 : 1. If for air the proportions are taken as 3 or 4 to 1,† the principal masses of the machine could generally be fully enclosed without carrying the casing as far back as the tail, and it is a matter for further investigation whether there is any advantage in enclosing the framework that carries the tail if such formation is not required for the purpose of completing the stream line casing itself. There seems to be considerable difference of opinion on the question of the resistance of wires such as are used by bracing these frameworks, and although there is a tendency at the present time to cover in the wires by a surfacing material extending over the whole of the framework, it is not altogether certain that the resistance is thereby reduced. It must be borne in mind, of course, that the extent of such surface bears a very high ratio indeed to the cross sectional area of the wires and struts that it covers, but in the absence of more reliable data as to the resistance of wires and struts, it is impossible to say much of a definite character on this subject.

Even on the matter of resistances generally we know little, especially skin friction resistance. Dr. Stanton, at the National Physical Laboratory, is responsible for the normal pressure constant, now universally accepted, and it is to be hoped that the same laboratory may some day put the coefficient of skin friction for air on an equally authentic basis. At the present time Bushy House is conducting a great many under water experiments, and although none are yet made with this end in view, nevertheless something in this direction may ultimately be done. As it is, the experiments are of a most interesting character and helpful indirectly to a fuller appreciation of the subject at issue.

There appears to be no reason whatever to doubt that under-water experiments can be co-related to experiments in air by a simple coefficient, and already the most important and interesting experimental work thus far conducted at the laboratory has been carried out in water channels instead of air channels. Dr. Stanton has, as all readers of FLIGHT know, accomplished many standard experiments in one of the wind tunnels that this institution possesses, but the larger wind tunnel, wherein more elaborate research work will be conducted, is not at the moment altogether in satisfactory working order, for it proves to be an exceedingly difficult matter to obtain an absolutely uniform and non-pulsating stream of air. There is less difficulty about controlling a flow of water, and although experiments therein are unfortunately limited to very small scale work, they are wonderfully handy of their kind, and it is quite likely that under-water experiments will always be carried on side by side with tests in air, if only for this reason.

One of the latest lines of investigation, which has proved to be unusually fascinating if at the moment it has not proceeded for a sufficiently long time to afford useful results, has to do with the flow of fluids at very low velocities. In order to see what is happening, a fine stream of red ink is admitted to the slowly moving water through a submerged tube. The red ink does not mix with the water at once as might be expected, but continues in a well-defined cord until it impinges upon an inclined plane or any other obstruction that is placed in its path. Here it slowly spreads out, and in the case of an inclined plane has a distinct tendency to leak over the extremities behind which it forms into a vortex swirl, that is an incomplete ring, but forms a very curious loop. These loops are created afresh at definite intervals, and each loop is linked up to the next by a kind of fine thread. It is particularly interesting to watch this almost lifelike movement by the aid of a powerful light, which, if sufficiently intense, will show the rotation of these filmy vortices about their own axial loops. Incidentally, it may be remarked that the red ink changes to a vivid green under a reflected light. The use of red ink itself is something that has had to be discovered, for it is not always easy to hit upon a convenient and suitable material for this sort of work. Another substance that has given very good results, and incidentally shows to what lengths it is necessary to go in order to find what is wanted, is Nestle's Swiss milk. A plate coated with this preparation and immersed in a slowly moving stream will be gradually and evenly washed clean, and as the milky substance is carried away by the water it forms a filmy shape of sufficient permanence to enable its motion to be closely observed. When the plate in question faces the current a formation somewhat like a jelly-fish is created around it, and it is possible to watch the eddies in the dead water behind the plate that is embraced by this partially ovoid shape.

* See article entitled "Can We Fly Faster for Less Power?" in FLIGHT of July 9th, July 30th, August 6th, and October 22nd, 1910, of how this value has been deduced from Zahm's experiments for flight speeds up to 90 miles per hour.

† Lanchester.

PROBLEMS RELATING TO AIRCRAFT.

By MERVYN O'GORMAN.

(*Continued from page* 322.)

60. **The Righting Couple when an Aeroplane Pitches.**—A simple *exposé* of the effects which conduce to the fore and aft stability of an aeroplane can be given if for the sake of clearness, the subject is not burdened with considerations of minor importance at first. We can thereafter revert to those to see whether they will negative, modify or strengthen the approximate conclusion first arrived at. To do this, let us consider an aeroplane to be travelling horizontally, and to continue travelling horizontally as a whole under the influence of its inertia and of the thrust of the propellers during the occurrence of the incidents to be investigated, namely :—

1. The air is approached by a machine which rides at its normal angle of flight.

2. The machine is *cabré*, *i.e.*, tilted or pitched up.

3. The machine is tilted or pitched downwards.

These three positions are clearly shown in the three diagrams, Figs. 4, 16 and 17.

NOTE.—It would be valuable if we could ear-mark the words *pitch* and *roll* for longitudinal and lateral movements of a pendulous kind respectively.

61. The assumptions are :—

(*a*) Neglect the fact that the centre of pressure on each

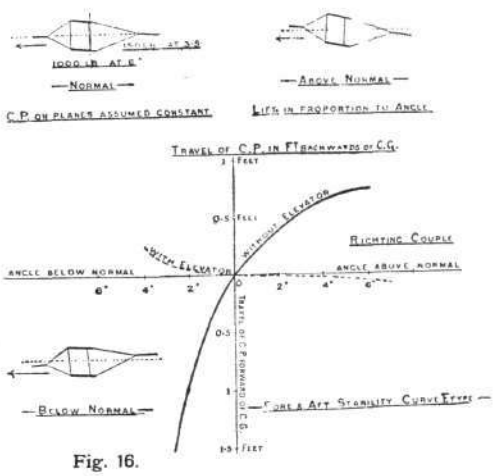


Fig. 16.

of the planes of an aeroplane moves slightly back when the up-tilt of the plane is slightly increased and *vice versa*.

(*b*) Assume (which is correct for all small angles) that the effect of tilting a plane or a wing is to increase the lift of that member in simple proportion to the increase of its angle.

(*c*) Assume that at the outset, the aeroplane is in normal flight with each plane at its normal angle.

(*d*) Assume the centre of gravity little, if at all, below the centre line of wind resistance.

(*e*) The angles taken are purely arbitrary—to get simple figures.

Clearly the weight of the aeroplane is a constant, and therefore the positive or negative righting couple, if there be one, is proportional to the travel of the centre of pressure away from the centre of gravity. In other words, the further the centre of pressure is at any moment away from the centre of gravity, the greater is the righting couple. This distance in feet is plotted for each angle of upward and downward tilt in Fig. 16 for an aeroplane of Class F.

62. **The Case of an F-type Aeroplane.**—Commence the investigation by disregarding the existence of the elevator plane in front. A not unusual loading of the planes in this type is about 1,000 lbs. on the forward plane and 150 lbs. on the back plane, see Fig. 16.

Assume with planes of the usual area an angle of 6° for the front plane and 3·5° for the back plane, and on calculating in accordance with the method of Fig. 16 for 2°, 4° and 6° of pitch of the machine upward, we find that the righting couple increases as the angle increases in accordance with the full line of Fig. 16 marked " without elevator."

63. This machine is accordingly stable under these conditions and will recover from upward tilt of 6° or a little more, provided it be not subjected to any disturbing or capsizing couple greater than, say, its weight acting at a distance of rather less than 1 ft. (or about one-twentieth of its weight, acting at the tail).

Moreover, it is still more stable in relation to tilt downward (called " below normal " in the diagram), for the righting couple after 4° of deviation is already 1·5 ft. multiplied by the weight, and is many times more at 6°, which is beyond the range of the diagram.

64. **The Effect of the Elevator in the F Class.**—The diagram shows that although the front elevator has its uses, it leads to a very much less satisfactory state of affairs from the point of view of fore and aft stability. The elevator in question is supposed to be flat (as is usual), and arranged so that its normal position places it on edge to the horizontal direction of flight.

The effect is shown by the dotted line (Fig. 16), where on the right-hand side of the diagram at angles of 4° and 6°

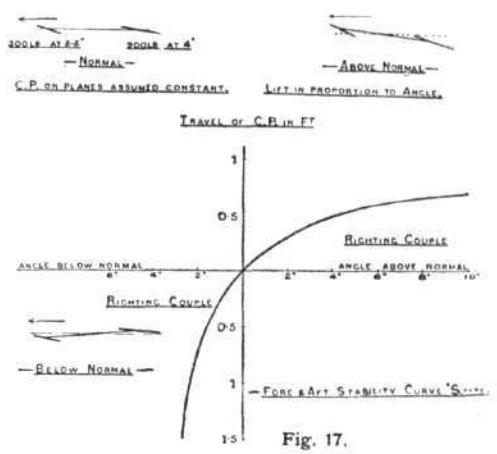


Fig. 17.

there is positively a capsizing couple, *i.e.*, a negative righting couple, while at the small angle of 1° or 2° there is just, and only just, equilibrium.

65. When, however, we consider the case where the planes are tilted by a gust so as to be below the normal, we get the state of affairs shown by the dotted line on the left upper quarter of Fig. 16, namely, an appreciable increase of instability at angles of 2° and 4°, calling for the active intervention of the airman, who has to correct this by raising his elevator. Though stability therefore exists at the zero deflection, its maintenance is in fact very soon referred to the dexterity of the operator, say after an angle of 3° or 1° respectively for the two sides, has been reached.

66. **Rapid Response to Controls.**—Needless to say, an aeroplane responds much more positively and with less loss of momentum, and sometimes more rapidly to any control, when it is nearly unstable in the direction in which that control operates. The existence of the elevator in this position to-day may be due to the strong demand for visible, positive and rapid response in the fore and aft direction, for that very vital operation of correctly alighting. This desire is generally expressed by airmen by stating that they feel more clear about the response of the aeroplane to the elevator if they can see it moving before them. They are quite right in wanting the quick response, and the aeroplane does doubtless respond more thoroughly, but for all that I think that experiments should be made to modify, if not

totally abandon, any member which diminishes the stability of normal flight, even though such member may, as is the case with this elevator plane, slightly increase stability under certain conditions, for example, when it is tipped up and heavily loaded on the occasion of checking a gliding flight.

67. **Class S Aeroplanes.**—In view of the above results one is naturally tempted to examine another type of machine, especially one where a plane in the position of the elevator plane is an essential feature.

In the left-hand top corner of Fig. 17 an S type aeroplane is shown diagrammatically. The distribution of loading is such that the small plane in front is set at an angle of 5·5°, *i.e.*, it is more heavily loaded per square foot than the main planes, which, being much larger, carry more total weight at a less angle, namely, 4°. The result is a Vee fore and aft.

68. First assume, that owing to a puff of wind, or some other accidental circumstance, the aeroplane as a whole becomes *cabré*, *i.e.*, pitches upwards 2°. As before, the increased angle of incidence of the air on the front plane increases its lift in the same ratio as the angle is increased, namely, as 5·5 is to 7·5, while the lift of the back plane is increased by a larger percentage, namely, from 4° to 6°. Accordingly, the centre of pressure travels towards the back plane, thereby tending to counteract the upward pitch, that is, it throws the machine back to the normal position.

To draw the curves it was necessary to determine the position of the centre of gravity (from the weight distribution of an ordinary machine), while the centre of pressure which must come in the vertical over the centre of gravity during horizontal flight in homogeneous air, must also be correctly given by the distances from the two planes and their total load.

69. It is worth while noticing that when the condition of the aeroplane indicated in the left-hand bottom corner exists, namely, the commencement of a downward pitching movement, a much more rapid increase of the righting couple with angular deviation exists than at the corresponding commencement of an upward pitching movement.

So greatly does this couple increase, that it is reasonable to say that an unintentional dive or header with this type of machine is difficult. Stability similar to this in all directions is what we want.

70. In spite of this, a well-known machine which would commonly be described as of this type, succeeded some time ago in taking a header and so meeting with a serious accident. There is in my mind little doubt but that when this occurred the front plane (which in this case is not fixed but is hand-controlled like an elevator) was carrying but little load per square foot compared to the back one. This at once gave an inverted Vee between the planes and removed the machine from the S Class. Accordingly, the taking of a dive was the natural and proper thing for it to do, just as a pyramid must totter if it were stood on its point. The only doubt was whether it should move head first or tail first. Since that date this designer has shown that the lesson was learnt. The cure for diving, unexpectedly enough, is to put the weight farther forward, and this has been done by him, and there is now probably no better machine for steady gliding, or what is called "*vol plané-ing*" (a horrible and unnecessary hybrid).

71. I have not dealt with lateral stability in this paper, and therefore I do not touch on the effect of rising and falling upon such lateral stability as is afforded by a Vee between the wings, by the use of fins, the boxing of the ends of biplanes, or the provision of flexible trailing edges and other such devices. I should none the less be very glad if the discussion were to produce expression of opinion from persons like Mr. Lanchester, Mr. Handley Page, Mr. Clarke, Mr. Dunne and others on this point.

(*To be concluded.*)

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MANVILLE £500 PRIZE AND BROOKLANDS.

MAJOR LINDSAY LLOYD, the Brooklands Clerk of the Course, writes us in regard to the regulations of the Manville £500 Prize just announced, and points out that the conditions for this prize are somewhat similar to the conditions for the prizes offered by the Brooklands Club at various race meetings, and that a good many of the days on which the Manville Prize can be competed for coincide with the days of these meetings. Major Lloyd continues as follows:—

"The differences between the conditions of the Manville Prize and our prizes are, that in the former, the competitor and aeroplane must be all British and a passenger must be carried, whereas in our competitions anyone can compete, and also, in the Manville Prize the competition can commence at 10 a.m., whereas the competition for the Brooklands prizes commences at 2 p.m., and continues for a little longer than in the case of the Manville competition.

"In order to ensure that a proper timekeeper is in attendance on the days of the Manville competition, should an aviator wish to compete at Brooklands, I will arrange for the presence of a timekeeper from 10 a.m. on each of the days on which the Manville competition will be held.

"Some competitors may wish to compete both for the Manville Prize and for the Brooklands prizes, and any performance put up on the Brooklands race days for the Manville Prize will count towards the Brookland prizes, and the conditions for the Brooklands prizes would be varied to this extent—that at 2 p.m., should an aviator be in the air, it will not be necessary for him to descend and make a fresh ascent to count towards the Brooklands prizes, but the time to count for the latter prizes will be taken as from 2 p.m.

"Further, as the conditions of the Manville Prize, in so far that a passenger is to be carried, are more onerous than those imposed on competitors for the Brooklands prizes, my Committee will offer on each Brooklands race meeting day a special prize of £10, to be awarded for the best performance under the Manville Prize competition over and above the prizes offered for the Brooklands competitions.

"I shall be pleased to receive intimations from those wishing to compete for the Brooklands prizes on April 17th as soon as possible, in order that their names may appear in the programme; and in the case of those entering for the Manville Prize, an intimation to that effect, as I propose to make a note in the programme of those competitors who are taking part in both competitions.

"The Royal Aero Club conditions for the Manville Prize do not state whose certificate is necessary as to whether Rules 6 and 7 (with regard to nationality of aviators and machines) are complied with, but that the decision of the Royal Aero Club shall be final. I take it that the Royal Aero Club Secretary will arrange with intending competitors as to the examination of their machines."

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ARMY OFFICERS VISIT "BRISTOL" AEROPLANE WORKS.

THE close attention which officers in the Army are paying to the question of the use of aeroplanes for military purposes was exemplified on Friday afternoon last week, when a large party of officers from the depôt of the Gloucestershire Regiment visited the Filton works of the British and Colonial Aeroplane Co., Ltd. The party included Col. G. W. Hacket-Pain, C.B., Commanding No. 7 District; Major G. F. Gardiner, Commanding Depôt, Gloucestershire Regiment; Captains W. A. M. Temple, J. E. Ruck, P. S. Vassall; Lieuts. W. P. S. Foord, H. F. L. Hilton Green, W. Wilkins, Quartermaster Gloucestershire Regiment.

Col. Hacket-Pain has taken a very great interest in the military aspect of aviation, and has written important articles on the subject, in which he expresses his great belief in the future of aviation from a military point of view. The party of officers were received at the works by Mr. H. White Smith, the secretary of the Company; Mr. G. H. Challenger, the Company's engineer; and Mr. Herbert Thomas, who conducted them over the works. The officers evinced the greatest interest in the process of the manufacture of the machines which was going on, and special interest was evoked by the two Bristol Military biplanes which have been completed to the order of the British War Office, and which are at present awaiting delivery. Mr. Maurice Tabuteau was prepared to give an exhibition flight, but the wind was blowing at so great a velocity that it was unsafe for him to venture.

A further occasion will be afforded, however, for demonstrating to the officers of the Gloucestershire Regiment the possibilities of the famous Bristol machines.

Mr. Henry M. Jullerot, who has just returned from India, where he has been carrying on experiments with the Bristol Military biplane in connection with the Indian Army Manœuvres, was present and had a long interview with Col. Pain, who was keenly interested in the recital of the aviator's experience in India.

CORRESPONDENCE.

**** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which they have read in FLIGHT, would much facilitate ready reference by quoting the number of each such letter.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

A Question of Sparking-Plugs.

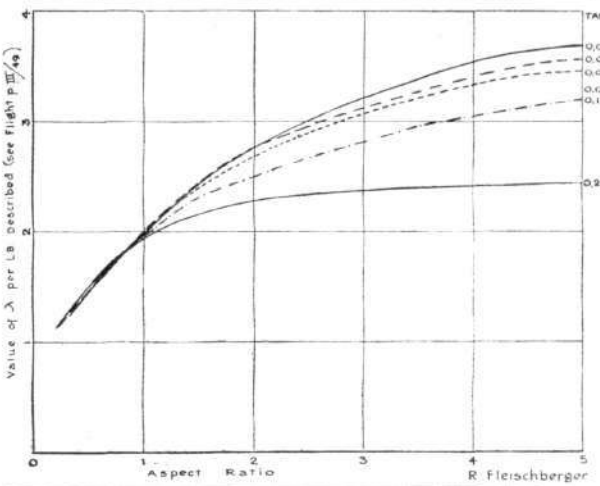
[1137] With reference to Messrs. Lodge Bros. and Co.'s letter in your issue of April 1st, we have examined our advertisement of March 25th and find that we did not directly claim that Mr. Sopwith was using our plugs, although we were certainly under the impression that he was. We should have substituted the word "magneto" for "ignition," which would have made everything perfectly clear.

THE BOSCH MAGNETO CO., LTD.,
J. A. STEVENS, Secretary.

Aspect Ratio.

[1138] I have read with interest L. B. Desbled's elucidation of the aspect ratio, and as one interested in aviation fully recognise the value of the information he gives.

I have worked out by my own reference several values



Aspect Ratio.	m.	$1-m$.	$\frac{1}{(1+m)^2}$.	$\frac{2m}{1+m}$.	Values of λ with tang α = 0	0·01	0·02	0·04	0·06	0·1	0·2
5	0·667	0·333	0·360	0·800		3·70		3·47		3·22	
4	0·600	0·400	0·391	0·750			3·42		3·18		2·41
3·5	0·556	0·444	0·408	0·718		3·40		3·22		2·96	
3	0·500	0·500	0·444	0·666			3·13		2·98		2·37
2·5	0·428	0·572	0·492	0·600		3·00		2·90		2·67	
2	0·333	0·667	0·552	0·500			2·76		2·66		2·27
1·5	0·200	0·800	0·693	0·333		2·43		2·40		2·31	
1	0	1	1	0		2		1·99			1·93
	−0·200	1·200	1·56	−0·5		1·647		1·653		1·667	
	−0·333	1·333	2·24	−1			1·455		1·467		1·502
	−0·428	1·428	3·05	−1·5							
	−0·500	1·500	4·00	−2		1·253		1·260		1·275	
	−0·556	1·556	5·08	−2·5							
	−0·600	1·600	6·25	−3							
	−0·667	1·667	9·02	−4			1·113		1·118		1·136
0	−1	2	∞	−∞							

of the variables in his equation for λ, as also the value of λ itself for various aspect ratios and tangents.

As the above table and diagram may be of interest to your readers, I submit same for publication. An interesting feature about the curves representing λ is that the second differential, apparently at a maximum between aspect ratio 1 and 2, again seems to increase between 4 and 5.

Lagos, W. Africa. R. FLEISCHBERGER.

Theory and Practice.

[1139] I read your article under the above heading with an interest the greater because I have followed the full course of your preceding articles upon "Can we Fly Faster for Less Power?"

The fourth of this instructive series, in your issue of October 22nd, 1910, was of especial interest, because it confirms the efficiency of the Crucifer body, and because, according to your article, "The whole question of efficiency at high speeds is, of course, primarily governed by the question of body resistance, which should be considered as a separate resistance and as an independent factor in the calculations, which must be reduced to a minimum by the use of suitable shapes and casings," as urged in this fourth article.

By the aid of the charts in your issues of July 9th and October 22nd, 1910, I have been enabled to make certain deductions as to the importance of shape, which so fully confirm the accuracy and momentousness of your statement that I venture to write them to you, trusting that they will be of interest to you and your readers.

Your charts enabled me to make a comparison of the factors of flight resistance at certain speeds, which disclosed the remarkable extent of the normal pressure experienced by the ordinary biplane of the Voisin or Wright type.

I assumed such an aeroplane with its load to weigh 1,000 lbs., and its passengers and other principal masses to expose together 20 superficial feet area to normal pressure. The charts indicated that this machine would absorb, approximately, 35½-h.p. to enable it to travel the air at 40 m.p.h. Of this total—

Skin friction absorbs	... ...	2½-h.p.
The load absorbs	... .	20 ,,
Normal pressure absorbs	.. ..	13¾ ,,

But, for increase of speed the chart discovered that the increase of power required to overcome normal pressure is very unfavourably disproportionate; for, at 90 m.p.h.,

Skin friction will absorb	... ...	15 h.p.
The load will absorb	... ...	45 ,,
Normal pressure	... .	120 ,,
Total	... ...	180 ,,

From these figures the tremendous potency of the normal pressure experienced by the principal masses, as a factor of flight resistance, is evident; and your insistence upon the necessity for enclosure of these principal masses and upon the importance of the shape of the enclosing body, that high speed may be attained, has the amplest justification.

The Crucifer shape combines a hemispherical head and a conically tapering body with a short cylindrical trunk between them.

Current aeronautical literature assumes that the experiments of Colonel Renard, M. Canovetti and others, conclusively establish that this form of vehicle is the best for rapidity of progress through either air or water. But, that the value of the reduction of pressure which may be effected by its employment should be appreciated, the pressure it experiences and that sustained by the normal plane and other forms and combinations of forms of equal cross-sectional area, which were submitted in experiment to direct air resistance, are compared below:—

Normal thin plane, 100; thin disc, 90; cone, base forward, 67½; two cones base to base, 18; sphere, 16; Crucifer body, hemisphere followed by short cylinder and cone, 3¾.

Crucifer body pressure is seen to be only 3¾ per cent. of the normal. Therefore were this body, with a cross-sectiona

area of 20 superficial feet, employed to enclose the principal masses of the ordinary biplane before-mentioned, the normal pressure would be reduced by 96¾ per cent., and the horse-power required to enable the machine to travel the air at 40 m.p.h. would be 23-h.p. instead of 35⅝-h.p.; and at 90 m.p.h. it would be 64-h.p. only, instead of 180-h.p.

At 40 m.p h. the power absorbed by normal pressure is 13⅛ h.p.; by Crucifer body pressure, ½-h.p. At 90 m.p.h. normal pressure absorbs 120-h.p., but Crucifer body pressure 4-h.p. only.

The comparison is startling and instructive. The Crucifer body converts normal pressure into mere skin friction, and makes a very high speed possible without undue cost. And this high speed should afford a double assurance of safety, independent of the pilot's intervention, because it is likely to endow the Crucifer machine with a stability which will supplement that already imposed upon it by its automatic controls.

Please accept my best thanks for the service your charts have rendered me.

Hayward's Heath. L. BEAUCLERC GOLDMAN.

Is the Helicopter Possible.

[1140] After reading the letter which appeared in your issue of January 7th (letter 1006, from Mr. Reynolds), I have taken the trouble to go more fully into the question of designing a helicopter on the lines I suggested in my letter of December 24th, and I am now in a position to state, positively, that a machine of the type I proposed would be a mechanical possibility at a weight not exceeding 15 cwts.

Mr. Reynolds cannot have much practical knowledge of flying machines, or he would not compare their structural laws with those governing the design of bridges and other mechanical structures.

If Mr. Reynolds takes as his guide the data available to the ordinary engineer-designer and applies it to the construction of a flying machine, he will be very much astonished at the weight of the resulting machine. It will be found in all machines which can fly, that the question of the safe load margin, so beloved by English designers of machinery, has to be almost entirely disregarded, and a machine produced which will stand up to its work with the lightest possible margin of strength, and (as is borne out only too sadly by most of the fatal accidents to aviators) with practically no margin for extraordinary strains which may arise in the course of flight.

In the machine I have sketched out planes are provided of sufficient size to assist the helical screws in supporting the machine in flight, and to counterbalance any fluctuations of horse-power which might momentarily reduce the efficiency of the supporting screws, and cause the machine to drop and to parachute the machine, or enable it to execute a *vol plané* in case of total stoppage of the screws. A helicopter without planes would be a death-trap, if it ever got any height up, to my mind.

In the machine I propose a 100-h.p. engine would drive a 10-ft. pair of helical screws, revolving in opposite directions (the gyroscopic effect of these screws would greatly enhance the stability of the machine), and a 50-h.p. engine would drive a 7-ft. tractor and propeller.

As nearly as I can estimate from what little data there is on the subject the planes would be 25 ft. by 8 ft., and steering would be effected by ailerons on the extremities of the planes.

Although it would possibly not attain high flight speeds, a machine on these lines would have great controllability, and would hover and descend in an almost vertical path, consequently less area would be required for stopping and starting places, and it would be much handier for general observation purposes.

Now that the question of human flight is having the attention of all thinking men in engineering circles, no doubt great strides will be made, but not on present aeroplane lines I feel sure.

The possibilities of aeroplanes are, after all, very limited, and I am convinced that before long the practical bird machine will make its appearance, and it will then give an impetus to a growing industry, and concentrate the lines of thought in a direction which will lead to the evolution of machines thoroughly practical and commercial in their uses, and more in accordance with natural principles.

There is a great deal more in the action of a bird's wings than most people, I venture to say, think; and when it is copied mechanically it will be simple but very different to the preconceived notions of bird flight, and very much less power will be required; in fact, I believe that man has sufficient power to fly if he can learn to apply it properly.

Coventry. WILLIAM A. WEAVER.

PUBLICATIONS RECEIVED.

Peut-on Voler Sans Ailes? By Paul Colliard. Paris: Librarie Aéronautique, 32, Rue Madame. Price 3 frs.

Le Constructeur de Cerfs-Volants. (1st series.) By C. Dubouchet and J. Protche. Paris: Librarie Aéronautique, 32, Rue Madame. Price 1 fr. 50.

Aeronautical Patents Published.

Applied for in 1910.

Published April 13th, 1911.

7,333. T. C. MURPHY AND J. M. BETT. Propulsion of aeroplanes.
7,372. A. F. POLLOCK. Flying machines.
7,381. T. F. ROBINSON. Kites, &c.
8,822. J. E. HARRIMAN. Aeromobile.
10,924. P. DALTON. Bamboo structures applicable to flying machines.
15,566. J. H. JENSEN AND J. P. MCGUIRE. Flying machine.
19,550. P. ZENS. Supporting or steering surfaces.
24,167. A. C. ULMER. Parachute.

Applied for in 1911.

Published April 13th, 1911.

6,110. A. F. POLLOCK. Flying machines.

DIARY OF COMING EVENTS.

British General Events.

July 1 .. Gordon-Bennett Aviation Cup Contest.
July 22–Aug. 5 *Daily Mail* Round England Contest.
Oct. 31 .. Close of British Michelin Cup.

Foreign Fixtures.

April 9–21 .. German Circuit—Ulm, Frankfort, Friburg, Strasburg, Carlsruhe, Mannheim, Wiesbaden (1016).
April 16 . Dresden Meeting.
April 27–May 16 German National Circuit—Aix-la-Chapelle, Cologne, Essen, Bielefeld, Brunswick, Berlin (975).
May .. Paris—Bordeaux—Paris.
June 4–30 .. European Circuit—Paris, Berlin, Brussels, London, Paris.

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